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ABSTRACT

This book combines in a single volume the findings of basic research and clinical studies conducted on the effects of alcohol, tobacco, and other drugs on the fetus, the mother, and the baby after birth and through lactation. It first outlines changing perspectives on teratology (the study of causes for birth defects), as knowledge about the dangers of maternal alcohol and other drug use has increased, and notes limitations of teratogenic research. It reviews maternal factors that influence pregnancy outcomes. Characteristics of drugs and their risk to the fetus are discussed, focusing on genetic vulnerability of the fetus, timing of drug exposure, dosage and patterns of consumption, and chemical properties of drugs. Hazards of prenatal exposure to specific drugs are then examined, including alcohol, tobacco, marijuana, cocaine, heroin and other opioids or synthetic narcotics, phencyclidine, and prescription medications. For each drug, information is provided on: suspected mechanisms for drug damage to the fetus, effects on fertility, effects during pregnancy and delivery, effects on the newborn, effects on breastfeeding, and effects on the growing child. Suggestions are then offered for counseling women about childbearing and childrearing risks of drug use. A section titled "For More Information" lists health information clearinghouses, compendiums of resources, publications and pamphlets, sources for treatment referrals, and additional readings. (Contains approximately 150 references.) (JDD)

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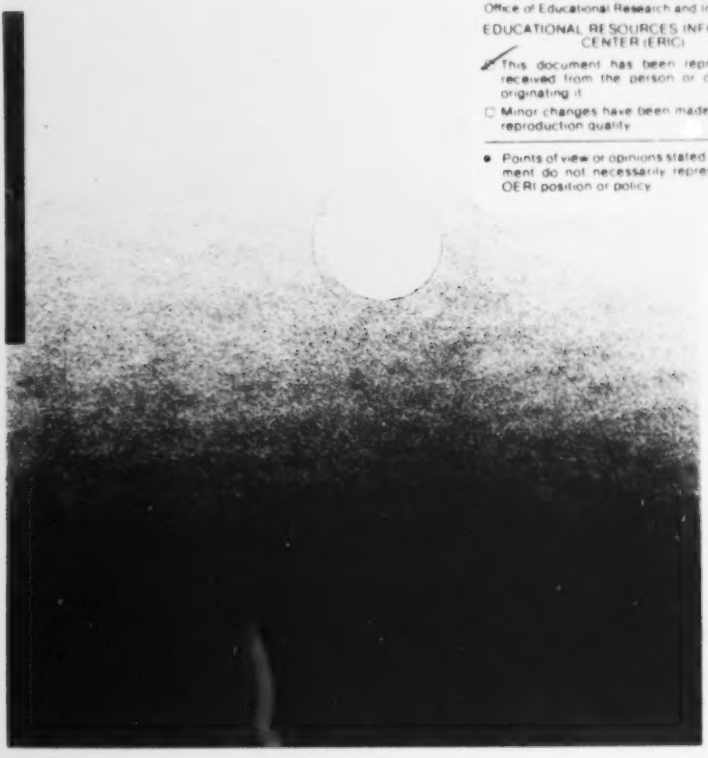

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ALCOHOL, TOBACCO, AND OTHER DRUGS MAY HARM THE UNBORN

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Foreword

During pregnancy, most drugs taken by the mother, including alcohol and tobacco, cross the placenta and enter the bloodstream of the developing fetus. Similarly, after birth, most drugs taken by the mother are passed on to the infant through the mother's milk. Not all babies show negative physical, mental, or emotional effects from perinatal exposure to drugs, but many do, and no one knows which infants will and will not be affected.

Many excellent publications have been written in the past decade about the dangers of drinking, smoking, and taking other drugs during pregnancy. The purpose of *Alcohol, Tobacco, and Other Drugs May Harm the Unborn* is to combine in a single volume the most recent findings of basic research and clinical studies conducted on the effects of alcohol, tobacco, and other drugs on the unborn, on the mother herself, and on the baby after birth through lactation.

This booklet is written for health care providers and all others working with young women of childbearing age. It is also written for volunteers active in the prevention and early intervention of drug abuse, including the abuse of beer, wine, distilled spirits, tobacco, and other drugs, be they illicit, prescribed, or over-the-counter.

Ultimately, this booklet is intended for women of childbearing age and their partners. I include the father because, through his own abstinence, a man can make a major contribution to a woman's drug-free lifestyle and safe pregnancy and to their child's health.

This publication offers an overview of almost 300 scientific books and articles on perinatal drug exposure. The authors have done a superb job of presenting the material in a clear, easy-to-follow-and-retrieve format that makes the booklet an excellent resource.

It is our sincere desire that this publication be used by many professionals and volunteers in the field and thus help alert and motivate young women and men to lead drug-free lifestyles to ensure a healthier life for themselves and their offspring.

Elaine M. Johnson, Ph.D.
Director
Office for Substance Abuse Prevention

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Introduction

An expectant mother hopes for one thing more than any other: a normal and healthy baby. If asked what she wants, a pregnant woman will usually reply, "I want the baby to be all right." Yet, many hundreds of thousands of infants born each year in this country may not be "all right" because they were exposed before birth to one or more harmful drugs used by their mothers.

Drug researchers are discovering more and more about persistent learning and emotional disabilities, as well as physical defects and health problems, attributable to alcohol and other drug exposure during fetal development. The Public Health Service document, *Healthy People 2000: National Health Promotion and Disease Prevention Objectives,* names alcohol use during pregnancy as the leading preventable cause of birth defects.

Children may suffer other disastrous consequences from their mothers' abuse of alcohol and other drugs. Who has not read the tragic stories of boarder babies – newborns abandoned by their crack-using mothers – or of infants suffering from perinatally contracted AIDS? Also, parental dependence on alcohol or other drugs is frequently associated with physical abuse and emotional neglect of youngsters during crucial formative years. Health care workers, as well as women of childbearing age and their partners, need to understand these risks in order to stem a growing epidemic. Drug-dependent pregnant women and their infants also need help to improve their chances for a healthy and satisfying life.

Extent of the Problem

Reliable estimates of the extent of alcohol and other drug use by pregnant women have been difficult to obtain. Until recently, no large-scale surveys had been conducted; most data came from maternal histories and infant birth records collected by individual hospitals or perinatal research centers. The findings from these studies were difficult to interpret because of methodological differences. During 1990, the Centers for Disease Control (CDC) and the

National Institute on Drug Abuse (NIDA) are initiating new surveys of in utero drug exposure to improve our understanding of this problem.

Nonetheless, surveys of current drug-using behavior among women of childbearing age provide useful indicators. Although many women stop or reduce their consumption of alcohol and other drugs in anticipation of pregnancy, not all babies are planned, and pregnancy may not be confirmed for as long as 2 months after conception – a period during which the developing embryo is particularly vulnerable to drug effects.

Surveys of smoking behavior consistently find that approximately 30 percent of women smoke at the time they conceive a child; 1 in 4 women continue to smoke during pregnancy. The youngest and the poorest (especially among unmarried, unemployed, or Black women) are the least likely to quit or to reduce the amount they smoke while pregnant.

Drinking among women of childbearing age (between 15 and 44 years) is even more common than smoking. Data from NIDA's 1988 National Household Survey indicate that 3 of every 5 women of childbearing age currently drink alcoholic beverages. In their peak reproductive years (18 to 34 years), 1 in every 10 American women consumes an average of 2 or more drinks a day or 14 or more drinks a week – an amount that could jeopardize an unborn baby.

The survey also found that nearly 10 percent of women of childbearing age acknowledged using an illicit drug during the month before the survey. Women's use of cocaine had increased markedly since the previous survey in 1985. In contrast to the use of other illicit drugs, which declined between 1985 and 1988, both daily and weekly cocaine use rose in this period. Further, the age group having the highest proportion of current (i.e., within 30 days prior to the survey) cocaine users was 18 to 25 years old – primary childbearing years for women.

When a mother uses drugs, her unborn or nursing infant is also affected. During gestation, almost all drugs cross the placenta and enter the bloodstream of a developing baby.

Recent surveys of obstetric patients and newborns, mostly from hospitals in urban areas, have confirmed alarming rates of illicit drug use during pregnancy. A pioneering study of 36 hospitals across the country sponsored by the Office for Substance Abuse Prevention and the March of Dimes in 1987 found that 11 percent of new mothers in the responding facilities (range from 0.4 to 27 percent) used cocaine, marijuana, heroin, methadone, amphet-

amines, and/or phencyclidine (PCP) while pregnant. A subsequent survey of 18 primarily public hospitals in 15 major cities by the House Select Committee on Children, Youth, and Families found a threefold to fourfold increase in the number of drug-exposed births between 1985 and 1988. Based on maternal histories or urine testing of the newborn infant, the 1988 rate of drug-exposed newborns in these hospitals ranged from a low of 4 percent in Denver, Colorado, to a high of 18 percent in Washington, DC, and Oakland, California.

In still another study, 715 women enrolling for public or private prenatal care in a Florida county during the first 6 months of 1989 had their urine tested for drugs. One in seven tested positive for alcohol, marijuana, cocaine, or opiates. There were few differences in prenatal drug use between the wealthier women (n = 335) seen by private practitioners and the poorer women (n = 380) being served by the public clinics.

There is some controversy about how accurately the rates of drug-exposed newborns from city hospitals can be extrapolated to live births for the Nation as a whole. Current estimates range from 40,000 to 75,000 drug-exposed babies per year (1 to 2 percent of all live births) to 375,000 (11 percent of births). However, these numbers only reflect maternal use of illicit drugs and would be much larger if alcohol and nicotine were included. The President's 1990 National Drug Control Strategy Report estimated that as many as 100,000 cocaine-exposed babies are born each year.

Individual facilities serving subpopulations of high-risk women confirm similar rates of cocaine metabolites and other drugs in urine tests of newborns and their mothers. Cocaine was found in the urine specimens of 10 percent of the 3,300 infants born in New York City's Harlem Hospital in 1988. A Philadelphia hospital center reported that the percentage of pregnant women with cocaine in their urine rose from 7 percent in 1985 to 58 percent in 1987. A review of maternal histories and urine tests for 215 consecutively delivered mother-infant pairs during a 1-week period in 1988 in Miami, Florida, found 12 percent with perinatal cocaine exposure and 17 percent with marijuana exposure. Nearly three-fourths of the cocaine-using mothers also smoked marijuana.

A 1988 study of 679 women receiving prenatal care at Boston City Hospital found that 17 percent used cocaine and 28 percent smoked marijuana during pregnancy. An earlier 1983 study of alcohol consumption among 1,711 pregnant women at the same Boston hospital noted that nearly 1 in 10 of these women (9 percent) were consuming 5 or more drinks on some occasions and a daily average at or above 1.5 drinks.

Women who drank heavily while pregnant were also more likely to smoke and to use illegal drugs.

The Purpose of This Booklet

The primary purpose of this publication is to provide accurate, up-to-date information for health care professionals and prevention workers to use in preconception, prenatal, and postnatal counseling of mothers and mothers-to-be. Potential parents need to know about psychoactive drugs' effects on their fertility and sexual functioning, as well as their impact on pregnancy and childbirth. Mothers – and fathers – also need to understand that using alcohol, cigarettes, and other drugs while pregnant increases the baby's risk for death, serious illness, physical deformities, developmental delays, and other abnormalities.

By encouraging mothers-to-be to avoid alcohol and other drugs as part of prepregnancy planning, the caregiver has a rare opportunity to prevent serious health consequences. Even in the earliest stages of pregnancy, many women are more than usually receptive to health-related information and motivated to alter dangerous behavior. This is important because quitting drug use during pregnancy is beneficial. Even cutting back can significantly reduce risk.

Unfortunately, some women (and their partners) do not respond to simple advice about the harmful effects of drugs. They may need more specific treatment for drug dependence and help in finding more positive ways to cope with life. When drug problems are identified and successfully handled, not only is a woman's physical and mental health improved, but her capacity for healthy childbearing and childrearing is also enhanced.

An infant with drug-related birth defects can be difficult to care for and may need special handling. Sensitive guidance immediately after birth can encourage crucial mother-infant bonding. Continued support in the postnatal period may be necessary to establish a caring and responsive family environment in which children can thrive.

Despite growing evidence of serious and persisting consequences to offspring from prenatal drug exposure, many physicians still fail to recognize signs and symptoms of alcohol and other drug use in their patients. They may also be reluctant to confirm such problems through direct questioning and laboratory testing. Clearly, caregivers must be better prepared and motivated to intervene early and appropriately. This booklet provides not only facts and a perspective on the reproductive hazards of drug use, but also some tips on how to counsel women about those risks.

Changing Perspectives on Teratology

Over the past 20 years, knowledge about the dangers of maternal alcohol and other drug use has increased dramatically. Before the 1960s, the placenta was generally viewed as a natural barrier, protecting the human fetus from most toxic substances the mother might consume. But a popular over-the-counter drug, widely used in Germany and England for relieving cold symptoms, quieting sick children, and soothing the nausea of pregnant women, shattered this assumption. Thalidomide, taken by women in the fourth to sixth week of pregnancy, was ultimately linked to the birth of thousands of infants with missing or deformed arms, and, less frequently, legs and ears.

This well publicized tragedy sparked a new interest in teratology—the study of causes for birth defects. Initially, research focused most intensely on the safety of fetal exposure to prescription medications, over-the-counter drugs, industrial chemicals, and pesticides. The Food and Drug Administration (FDA) began to require information on known or suspected risks to the fetus and newborn in a special section of the product-labeling data for all marketed drugs. This information helps physicians and consumers weigh the potential benefits to the pregnant or breastfeeding mother against possible harmful effects on the unborn child or nursing infant.

Public concern about the dangers

In utero drug exposure is associated with an increased rate among newborns of (1) low birthweight, with small for gestational age length and head size, (2) central nervous system damage that may delay or impair neurobehavioral development, (3) mild to severe withdrawal effects, and (4) certain congenital physical malformations.

from prenatal use of social drugs increased considerably following the Surgeon General's 1980 report on *The Health Consequences of Smoking for Women* and a warning the following year that women should not drink alcoholic beverages while carrying a child or nursing. Currently, the medical literature abounds with articles concerning adverse effects on the newborn from a mother's use of alcohol, cigarettes, and illicit drugs during pregnancy and lactation.

At the same time, the concept of teratology has been expanded to include more subtle behavioral and developmental abnormalities in offspring that only become apparent later in an infant's life. These latent deficits and/or delays that are not obvious at birth are often referred to as neurobehavioral effects.

Multiple Maternal Factors Influence Pregnancy Outcomes

An expectant mother's use of tobacco, alcohol, or other drugs is only one of many risk factors associated with a complicated pregnancy, congenital defects in the offspring, or both. Other risks that must be kept in mind when assessing the likelihood of adverse pregnancy outcomes include (1) a family or maternal history of reproductive problems, (2) multiple previous pregnancies within a short timespan, (3) concurrent medical problems such as sexually transmitted diseases (STDs), diabetes, lupus, hypertension, and heart, liver, or kidney disease, (4) serious overweight or signs of poor nutrition, (5) being under 15 years old, (6) poor living conditions and lack of education, (7) an unhealthy lifestyle with poor eating habits, lack of regular exercise, and excessive stress, (8) inadequate prenatal care, and (9) chronic or intense exposure to a variety of known teratogens in the environment (e.g., x rays, lead, pesticides).

Unfortunately, these risks are often interrelated. A woman with one risk for a complicated pregnancy or defective baby is likely to have several. The risks may not be simply additive, either, but may interact synergistically, further increasing the odds for an undesirable outcome. For example, the drug-dependent mother seldom uses only one drug. A woman who smokes is also more likely to drink and use other psychoactive substances than a nonsmoker.

Women who smoke cigarettes, drink alcoholic beverages, or use other illicit drugs during pregnancy increase their risks for obstetrical complications and for premature labor and delivery. They are also more likely than abstaining mothers to suffer fetal losses through spontaneous abortions, miscarriages, and stillbirths.

A woman who is drug dependent and poor is also likely to be malnourished and to have related health problems.

She is often young, unmarried, under considerable stress, and a disadvantaged minority group member.

Characteristics of Drugs and the Fetus Affect Risk

In addition to the health status and lifestyle of the mother, characteristics of the developing embryo/fetus and of the drugs themselves can increase the chances of adverse outcomes in prenatally drug-exposed babies.

Genetic Vulnerability of the Fetus

Most unborn babies develop normally; congenital malformations are still exceptional. Gross structural defects are estimated to occur in only 1 to 3 percent of newborns. By the time babies are a year old, however, this percentage doubles as more subtle abnormalities are diagnosed that were difficult to identify in the neonate.

Until the early 1940s, heredity was thought to be the major cause of congenital defects. Even with greatly increased knowledge about the teratogenic potential of a variety of licit and illicit drugs, as well as maternal illnesses and other environmental agents, the causes of most birth anomalies and developmental defects remain unclear. Abnormalities continue to appear in the absence of embryonic or fetal exposure to known teratogens. In fact, about as many birth defects are attributed to hereditary susceptibility as to prenatal environmental causes (approximately 10 to 15 percent in each category).

Furthermore, not every baby that is exposed to even large amounts of harmful drugs before birth develops serious defects. The genetic endowment of the developing fetus has an important influence on the likelihood of toxic effects occurring. In humans, fraternal twins born to alcoholic mothers have shown different amounts of damage from the same prenatal exposure. Animal research confirms that different strains of the same species have different responses to in utero drug exposure. In the words of one prominent researcher, "... it is misleading to portray the embryo as having a kind of gossamer fragility that will be silently ravaged by all alien invaders."

It would be foolish, however, to rely on unborn babies' inherited resistance and resilience in the face of our increasing knowledge about preventable birth defects.

Not all babies show negative effects from prenatal exposure to drugs. A variety of genetic factors in the unborn baby and maternal characteristics, as well as differences in the chemical structure of drugs and their use patterns, interact to influence the vulnerability of the unborn baby.

Timing of Drug Exposure

One of the most important variables affecting birth defects is the stage of the unborn baby's development when its mother consumes alcohol, tobacco, or other drugs.

Conception occurs when a mature egg is fertilized in the fallopian tube following ovulation. Before fertilization, the egg is vulnerable to toxic chemicals. However, between fertilization and implantation of the growing and dividing egg in the lining of the uterus about a week after conception, the tiny blastocyst is relatively resistant to damage from drug exposure.

The embryonic phase, from about the second through the eighth week following conception, is critical for developing vital organs, the brain, and other major biological systems. Within a span of only 10 days – from 15 to 25 days after conception – the basic structure of the human central nervous system (CNS) is differentiated from other organ systems. Within 20 to 30 days, the beginning of the skeleton, limb buds, and muscles can be seen. Between 24 and 40 days of development, rapid progress is made in the differentiation of eyes, heart, and lower limbs. By 60 days, other body organs are being formed.

During this stage (also called the period of organogenesis), the rapidly growing embryo is especially vulnerable to chemical injury. Exposure to toxic doses of some drugs may be lethal, resulting in spontaneous abortion. Alternatively, malformations may occur in the most susceptible organs or limbs at the time of drug exposure. Since most women do not confirm that they are pregnant for several weeks or months after conception, they should be advised to avoid all unnecessary drug use as part of preconception planning. It is suspected, for example, that the third postconception week of human pregnancy is the critical period for the teratogenic actions of alcohol to produce the most severe and characteristic features of fetal alcohol syndrome (see next section).

The fetal stage of pregnancy, from the eighth week after conception to

birth, is the time of greatest neurological development and rapid weight gain by the developing baby. Drug exposure during this period is most likely to result in intrauterine growth retardation (IUGR) and subtle mental and behavioral deficits that are not as apparent as gross retardation – and not immediately detectable at birth.

Dosage and Patterns of Consumption

A fundamental premise in the study of drugs is that there is a dose-response relationship between the degree of exposure and the effects produced. This also holds true for the fetus – effects are generally more toxic at higher doses, ranging from minimal, unobservable responses through functional impairments and malformations to death. Researchers are uncertain of the minimal dose below which maternal use of particular drugs may be relatively safe for the fetus. There is general agreement, however, that the risks to the unborn child are greatly increased when the expectant mother consistently consumes large doses of harmful drugs or periodically binges.

A variety of factors affect the unborn baby's exposure level when the mother takes drugs. First of all, drug use often fluctuates during pregnancy. Many expectant mothers spontaneously quit or sharply reduce their alcohol and drug consumption in the early weeks of pregnancy because of nausea and other unpleasant reactions, as well as out of concern for the unborn baby's health. Second, although most abusable drugs that act on a mother's brain also cross the placenta and reach the fetus, animal research has demonstrated important differences among drugs in the rate and extent of this placental transfer. Alcohol and opioids, for example, appear to effect the fetus more rapidly than marijuana.

The way the drug is taken also affects the amount that reaches the fetus. Drugs taken by mouth do not enter the mother's bloodstream and cross the placenta as rapidly as those inhaled or injected and may reach the fetus in lower concentrations. In addition, a pregnant woman and her unborn baby may have different concentrations of a substance in their systems because of constantly changing abilities in the developing fetus to clear drugs from its own body. Preg-

After the eighth week of pregnancy, maternal drug use is more frequently associated with growth-retardation, prematurity, and neurological damage to the infant. Drug use near the time of delivery may precipitate labor and can be hazardous.

nancy may also alter the mother's metabolism of drugs, thereby diminishing or enhancing their effects.

Chemical Properties of the Drug

Drugs also differ in the types of embryonic or fetal responses they typically produce, especially at different concentrations. Some, like alcohol, seem to produce a full range of dose-related effects in the developing baby that rather closely reflect toxic responses in the mother. Others, like thalidomide and vitamin A derivatives (Accutane), are highly toxic or lethal to the embryo or fetus at doses in the therapeutically prescribed range for the mother. Still other drugs produce abnormalities only at specific sites (e.g., cleft palate), as well as being stage- and dose-dependent. Some abusable drugs (e.g., marijuana, heroin, methadone, nicotine) are not so frequently associated with gross structural malformations in prenatally exposed babies as with deficits and delays in neurobehavioral functioning.

Many women do not even realize they are pregnant during the early weeks of pregnancy when the major skeletal and organ systems are forming and are most vulnerable to toxic effects from drug exposure.

Teratogenic Research Has Many Limitations

A field of intense new interest is often marked by conflicting reports and controversy until scientists have had time to confirm initial findings. The study of prenatal drug effects is particularly difficult, not only because of its newness and the constant media attention, but also because of methodological limitations. Controlled drug experimentation with pregnant mothers is out of the question for obvious ethical reasons, but there are other problems with laboratory findings and survey techniques. The following difficulties should be kept in mind as new reports appear.

Animal Research

Animal studies are important in teratogenic research. Scientists experiment with mice, rats, sheep, dogs, and other small animals to reproduce and confirm observed or suspected hazards to prenatally drug-exposed human babies. Carefully controlled laboratory conditions that cannot be reproduced in clinical studies are crucial for understanding the mechanisms of teratogenicity, as well as for testing the safety of new therapeutic drugs.

Unfortunately, animal data are not always reliable predictors of developmental hazards to humans. No animal has a reproductive system exactly like that of a woman, and the reproductive effects of drugs in animals are not always the same as in humans. Species differences in drug reactions can sometimes be minimized by testing more than one species.

Laboratory experiments seldom replicate the natural conditions under which humans use drugs. Animals, for example, are often given doses far in excess of those used by humans. Drugs are also administered quite differently from usual human consumption methods (e.g., dripped into animals' veins or added to their food rather than smoked or snorted).

Research With Humans

Retrospective, after the fact, surveys of mothers with defective offspring, as well as prospective studies of pregnant women, also have limitations. Self-reported drug use may be inaccurate. Mothers may have diffi-

spring, as well as prospective studies of pregnant women, also have limitations. Self-reported drug use may be inaccurate. Mothers may have difficulty remembering how much, or even what, substances they took during a pregnancy that may have occurred many months or even years before. Pregnant women, particularly if they are dependent on alcohol or other drugs, may be unwilling, or unable, to reveal the true extent of their drug use. They may be unreliable in reporting the amounts they drink or smoke and may simply not know the purity of illicit drugs they take.

The questions researchers ask, and how they are asked, sometimes affect the accuracy of women's responses. While urine testing is a more reliable indicator, analysis of occasional specimens – or those taken at delivery – is not sufficient to track changing drug patterns throughout the pregnancy.

Even more importantly, it is very difficult in clinical studies to separate risks for abnormal birth outcomes associated with prenatal exposure to alcohol and other drugs from other interactive factors related to the mother's lifestyle and living conditions. Pregnant women in these studies frequently use a variety of drugs – together or sequentially – and have many other risk factors for fetal impairment that make it virtually impossible to attribute teratogenic effects of drug exposure to any single substance.

Methodological Problems

Another problem with human research is the small number of cases available for some studies. Those subjects who agree to participate may not be representative of the drug-using group under study. This is especially likely when studying illicit substances. As a result, the early findings regarding effects of prenatal PCP or crack exposure, for example, are unlikely to be as consistent and valid as those based on 20 years of well-controlled, large-scale, and replicated research on the effects of cigarette smoking or alcohol use.

There are also measurement problems in this type of research. For instance, gestational age is not always considered when reporting the newborn's length and weight. Measuring other defects in newborns can be very difficult too. Repeated testing may be necessary to determine whether the damage is temporary or permanent. If improvement occurs, it is sometimes hard to know whether the change is due to natural maturation or to some form of intervention.

There is little agreement among researchers on how smoking and drinking patterns should be categorized (e.g., what is heavy or moderate consumption?). Statistical groupings may not accurately reflect some individuals' potentially very dangerous alternating patterns of binges and abstinence. Use patterns for illicit

Hazards of Prenatal Exposure to Alcohol, Tobacco, and Other Drugs

The following sections briefly summarize the known – or strongly implicated – dangers to expectant mothers and their offspring from alcohol, tobacco, and other drug use during pregnancy and while nursing. Because the potential for harmful effects is not completely established and use of these drugs has no health benefits, the safest recommendation is for women to avoid these substances before conception, during pregnancy, and while breastfeeding.

Alcohol

Beverage alcohol (ethanol) is so common in our society that we seldom think of it as a drug. Yet beer, wine, liquor, and the new wine coolers are all central nervous system depressants. They are similar to barbiturates and other sedative drugs in slowing down bodily functions such as heart rate and respiration. When consumed in small quantities, alcohol induces feelings of well-being, conviviality, and relaxation. But in larger amounts, it progressively causes intoxication, stupor, unconsciousness, and, sometimes, respiratory arrest and death. Chronic, heavy drinking can seriously damage the body and is associated with liver disorders, poor nutrition, high blood pressure, heart disease, and deficiencies in the body's immune response, as well as having serious effects on brain functioning.

Suspected mechanisms of drug damage to the fetus: Numerous animal studies demonstrate that alcohol and its primary metabolite, acetaldehyde, are directly toxic to the developing embryo and fetus and capable of producing abnormalities. Alcohol may also interfere with the delivery of maternal nutrients to the fetus, impair the supply of fetal oxygen, derange protein synthesis and metab-

olism, or stimulate excess production of certain prostoglandins that modulate cellular functions of the body and could cause fetal malformations.

Effects on fertility: Chronic alcoholism or heavy drinking can interfere with the fertility of both men and women. In men, testosterone levels and sperm counts are lowered, sexual drive is diminished, and impotence, testicular atrophy, and gynecomastia (breast development) may also occur. The broad spectrum of alcohol-associated reproductive problems among women include amenorrhea (cessation of menses), menstrual cycle irregularities, anovulation (cessation of ovulation), derangement of reproductive hormonal functions, ovarian pathology, and early menopause. Even social drinkers who consume three or more drinks a day are at increased risk for menstrual cycle dysfunctions.

Effects during pregnancy and delivery: Alcoholic women have more obstetrical complications, particularly vaginal bleeding, premature separation of the placenta, and fetal distress. Maternal alcoholism is also associated with high rates of spontaneous abortion, miscarriage, and stillbirth. The risk for spontaneous abortions is dose related: pregnant women averaging three or more drinks a day are more than 3 times more likely to miscarry than nondrinkers. Even women who consume only one or two drinks a day are at increased risk for miscarriage during the second trimester of pregnancy.

The effects of alcohol on prematurity are less conclusive. Several retrospective studies found an association that has not been confirmed by larger prospective studies. However, consuming two or more drinks per day may increase the chances of a premature delivery.

Effects on the newborn: Low birthweight and intrauterine growth retardation (IUGR) – with shorter than normal length and smaller head and chest circumference measurements accompanying the low birthweight – are the most consistently observed effects of fetal exposure to alcohol. These problems seem more severe among women who drink heavily during the last 3 months of their pregnancy. Pregnant women consuming between one and two drinks per day are twice as likely as nondrinkers to have a growth-retarded infant weighing less than 5.5 pounds. Lowered birthweight and IUGR increase risks for an infant's early death and for respiratory difficulties, feeding problems, serious infections, and long-term developmental problems.

Several additional factors may also contribute to risk for IUGR. Chronic beer drinking during pregnancy appears to be the most significant

determinant. Birthweight deficiencies among newborns are also associated with their beer-drinking mothers' lower weight gain during pregnancy, lower weight at conception, being Black, and smoking cigarettes.

FAS is now the leading known cause of mental retardation. The cognitive functioning of FAS children with the most severe CNS involvement does not improve, even with remedial instruction.

Newborns whose mothers drink heavily (an average of five drinks per day, especially during the last 3 months of pregnancy) may show signs of alcohol withdrawal such as tremors, abnormal muscle tension (hypertonia), restlessness, sleeping problems, inconsolable crying, and reflex abnormalities. Heavy maternal alcohol use is also associated with a decreased ability among newborns to tune out inappropriate stimuli, poor sucking abilities, and disturbed patterns of sleep and wakefulness.

More research is needed on the interaction between drinking and cigarette smoking. This combination of drug use has been found to reduce the responsiveness of newborn babies whose mothers drank socially and smoked moderately during pregnancy. Even babies whose mothers consume only one drink a day during the first 3 months of pregnancy have more erratic sleeping patterns than infants of nondrinking mothers.

Since the beginning of the 18th century, physicians and researchers in England and France have observed and reported harmful effects of maternal alcohol consumption on offspring. It was not until 1973, however, that a group of scientists at the University of Washington, Seattle, labeled a characteristic pattern of severe birth defects as "fetal alcohol syndrome" (FAS). Numerous cases of this syndrome from all over the world have now been reported. A conference of research specialists in 1980 outlined standards for FAS diagnostic criteria, which require at least one feature from each of three categories:

1. Prenatal and postnatal growth retardation – with abnormally small-for-age weight, length, and/or head circumference
2. Central nervous system disorders – with signs of abnormal brain functioning, delays in behavioral development, and/or intellectual impairment
3. At least two of the following abnormal craniofacial features – small head, small eyes or short eye openings, or a poorly developed philtrum (the groove above the upper lip),

thin upper lip, short nose, or flattened midfacial area

Other abnormalities have also been reported in conjunction with FAS, including crossed eyes (strabismus) and near-sightedness, malformations of the ears, heart murmurs, liver and kidney problems, retarded bone growth and skeletal defects, increases in upper respiratory infections and in middle ear infections (otitis media), undescended testicles, and hernias.

FAS is now the leading known cause of mental retardation. Several investigators have noted that the degree of mental impairment among FAS children correlates closely with the severity of their craniofacial malformations and growth deficiencies. The cognitive functioning of FAS children with the most severe CNS involvement does not improve, even with remedial instruction.

It is not known exactly how often FAS births occur. Studies of population groups in the United States have most consistently found rates ranging from 1 to 3 cases per 1,000 live births. European cities that have been studied have comparable rates, averaging 1 case per 650 live births. However, among one American Indian population at particularly high risk for alcoholism, a rate of 9.8 cases per 1,000 births was observed.

Not all alcoholic women who become pregnant deliver babies with FAS. In one study of contributory risk factors, an FAS diagnosis was most frequently associated with the mother's persistent drinking throughout pregnancy, a greater number of alcohol-related problems (measured on the Michigan Alcohol Screening Test – MAST), a larger number of previous births, and being Black. Women with all four characteristics had an 85-percent chance of producing a baby with FAS. In contrast, women with none of these risk factors had only a 2-percent probability for an FAS baby. In another high-risk group, 1 in 4 mothers who had already had an alcohol-affected child gave birth to other FAS-diagnosed children. In more recent work, drinking an average of three drinks per day during the period following conception and before pregnancy was confirmed (organogenesis phase) was the threshold at which risk increased for the characteristic craniofacial anomalies in newborns that are used to diagnose FAS. However, taking an

Binge drinking of more than five drinks on any occasion and drinking during the first 2 months of pregnancy are two of the strongest maternal predictors of later neurobehavioral deficits among offspring.

occasional drink during the earliest weeks of pregnancy did not increase risk for these alcohol-associated anatomical defects.

Prenatally alcohol-exposed babies with birth defects that do not meet all three criteria for an FAS diagnosis may be categorized as having suspected "fetal alcohol effects" (FAE). These adverse consequences of maternal alcohol use usually include growth retardation and are estimated to be about 3 times more frequent than FAS. One perinatal specialist estimates that as many as 5 percent of all birth defects may be attributable to prenatal alcohol exposure.

Effects on breastfeeding: Alcohol reaches the same concentration in mother's breast milk as in blood and is rapidly transmitted to the nursing infant. Because milk consumed by the baby is diluted with body water, the infant's blood alcohol content (BAC) will ordinarily remain much lower than the mother's. A single drink by a breastfeeding mother is probably not much cause for alarm, but chronic exposure of the nursing infant to high doses of alcohol is potentially dangerous. A baby oxidizes alcohol more slowly than an adult.

Heavy drinking by the mother can decrease her milk supply, as well as inhibit the milk-ejection reflex. Nursing babies whose mothers regularly consume alcohol may be irritable, drowsy, and have abnormal weight gain. Animal and human research also indicates that newborn infants exposed to alcohol before birth have weaker sucking responses than those born to nondrinking mothers. Although the decision to breastfeed entails complex risk-benefit issues, the safest recommendation is that women not consume alcohol when nursing.

Effects on the growing child: The neurobehavioral effects of prenatal alcohol exposure reflect a spectrum of dose-dependent gradations, ranging from gross retardation to subtle CNS deficits. Although neurobehavioral effects are produced at lower levels of maternal drinking than gross physical malformations and growth deficiencies, they may be more devastating to youngsters in the long run. Binge drinking of more than five drinks on any occasion and drinking during the first 2 months of pregnancy are two of the strongest maternal predictors of later neurobehavioral deficits among offspring.

Children whose mothers drank heavily during pregnancy may exhibit developmental problems such as hyperactivity, distractibility, short attention spans, language difficulties, and delayed maturation, even when their intelligence is normal.

FAS-diagnosed children continue to show poor muscle tone, poor control of their body movements, and

delayed mental development. Even with proper nourishment, these children do not catch up to normal children in their physical growth. They also have decreased attention spans and delayed reaction times.

Although neurobehavioral effects are produced at lower levels of maternal drinking than gross physical malformations and growth deficiencies, they may be more devastating to youngsters in the long run.

In studies tracking the development of children born to light and moderate drinkers, researchers have also correlated their mothers' drinking patterns during pregnancy with decreased attention spans and delayed reaction times in the offspring, and with IQ scores at age 4 years. Youngsters whose mothers averaged three drinks per day during pregnancy were likely to have IQs averaging five points lower than normal. However, fewer than 1 in 5 of the 4-year-olds in this study whose mothers consumed an average of four drinks per day while pregnant were determined to be clinically abnormal after extensive examinations.

Ten years after the first 11 FAS infants were described, 8 were located and reexamined. All were still below average in height and in head circumferences, and four were severely retarded, with IQs between 20 and 57. In addition, new physical problems were found: chronic middle ear infections together with some hearing loss, poor alignment of the teeth, and vision problems. Only two of the children were living with their natural mothers. Three of the mothers died of alcoholism before their children were 6 years old.

More recently, one of the Seattle scientists reported that impairments in intelligence and academic achievement resulting from alcohol-related birth defects (FAS/FAE) continue into adolescence and young adulthood. Arithmetic skills seem to be more seriously affected than reading and spelling abilities. The psychosocial problems of many FAS/FAE adolescents may also stem from in utero alcohol exposure. The worst behavioral outcomes, however, probably reflect a combination of prenatally induced brain damage and childrearing in a high-risk environment of parental alcoholism. Some clinicians are encouraging about the potential reversibility of some behavioral abnormalities in alcohol-exposed children as they mature and participate in remedial programs.

Tobacco

Nicotine, the psychoactive ingredient in cigarettes, is an addictive, biphasic drug that can both stimulate

and relax the user. Tobacco smoke also contains many other toxic ingredients, including carbon monoxide, nitrous oxide, lead, hydrogen cyanide, and 43 known carcinogens.

Cigarette smoking is the major single and preventable cause of disease and premature death in the United States. Smoking is a cause of coronary heart disease, stroke, chronic obstructive pulmonary disease, cancers of the lung, mouth, larynx, and esophagus, and other circulatory disease. Women cigarette smokers who also take oral contraceptives are at dramatically increased risk for heart attacks (myocardial infarctions) and strokes (subarachnoid hemorrhages). The risk is dose related.

Despite growing public concern about smoking, public policies to discourage tobacco use, and an overall reduction in smoking among American adults, smoking among women has declined much more slowly than among men. Decreases in smoking initiation rates among young women, particularly those with less education, did not keep pace with declining rates for males in the years between 1965 and 1985. For more than a decade, more adolescent girls than boys in their senior of high school have reported being daily cigarette smokers. Quitting smoking is also difficult: relapse rates are comparable to those for alcoholics and heroin addicts. Approximately two out of three users who stop taking any one of these drugs resume use by the end of a year.

Suspected mechanisms of drug damage to the fetus: While nicotine crosses the placenta, its harmful effects are primarily the result of blood vessel constriction in the mother and the consequent reduced oxygen supply to the fetus. This oxygen reduction (hypoxia) is also increased by carbon monoxide interfering with the blood's ability to distribute oxygen throughout the body.

Effects on fertility: Fertility is often impaired in men and women who smoke. Several large-scale studies have found higher infertility among smoking than nonsmoking women. A 1985 study found that women smokers were 3.4 times more likely than nonsmokers to take a year or longer to conceive a desired child. Women who smoked more than a pack and a half of cigarettes a day had a 43-percent lower fertility rate than nonsmokers. Women who smoke regularly are also more likely than nonsmokers to have menstrual irregularities and amenorrhea (cessation of menses). Among men who smoke, the secretion of male hormones is reduced, sperm production and mobility are lowered, and more sperm are abnormally formed. These effects can cause male infertility, especially among those who are only marginally fertile.

Effects during pregnancy and delivery: There is a direct correlation between the amount of smoking during pregnancy and the frequency of spontaneous abortion and fetal death. Pregnant women who smoke also have significant increases in premature detachment of the placenta (abruptio placentae), vaginal bleeding, abnormalities in placenta attachment to the uterus (placenta previa), ruptured membranes, and preterm delivery. All these complications of pregnancy carry a high risk of perinatal loss.

Maternal smoking has been implicated in as many as 14 percent of preterm deliveries in the United States. Prematurity increases the risks for early infant death and for respiratory illness. A recent large-scale study of over 30,000 pregnant women in Northern California found that preterm births were 20 percent more common among women who smoked a pack a day or more during pregnancy when compared to nonsmokers.

Effects on the newborn: There are conflicting findings regarding an association between smoking and some congenital malformations (most usually heart defects, cleft palate, hernias, and central nervous system abnormalities). This lack of a consistent pattern has led some researchers to conclude that maternal (or paternal) cigarette smoking is probably not the sole cause for these abnormalities. However, recent large-scale studies confirm a positive association between physical defects among newborns and maternal smoking during pregnancy. There are higher rates of abnormalities in a variety of categories for children born to smokers than to nonsmokers.

Women who smoke during pregnancy have babies that are, on average, 7 ounces (200 grams) lighter than those born to comparable nonsmoking women. Reductions in infants' birthweight are proportional to the amounts mothers smoke and are independent of other risk factors and gestational age. The earlier in pregnancy that a woman stops smoking, the better her chances for delivering a normal-weight baby. Based on a nationwide study, if all women stopped smoking during pregnancy, the frequency of low birthweight infants would decrease by amounts ranging from 35 percent among mothers with less than a high school education to 11 percent among those born to college graduates. These low birthweight babies are also shorter than normal for their gestational age and have smaller head and chest circumferences. Long-term studies, still in progress, provide no indication that these growth-retarded children catch up in later years.

Passive smoking – being exposed to the smoking of others – has recently been indicted for having

harmful effects on pregnancy. A study of 500 Danish women found that pregnant nonsmokers married to smoking husbands consistently had lower birthweight babies than those married to nonsmokers. The infants' weight reduction was only about a third less than if the mothers themselves smoked. Another study of more than 900 nonsmoking American women passively exposed to cigarette smoke during pregnancy found that they had twice the risk of delivering a low birthweight baby compared to mothers not similarly exposed. A third study of over 1,200 nonsmoking women, whose passive smoke inhalation during pregnancy was confirmed by blood tests, also found that they gave birth to consistently lower birthweight infants than those not exposed to tobacco smoke.

Three studies found low Apgar scores among babies born to smoking mothers. (Apgar scores evaluate the basic health of newborns at 1- and 5-minute intervals after birth by measures of heart rate, respiration, reflexes, muscle tone, and skin color.) One study involving 43,000 babies reported low scores occurring 4 times as often among the newborns of mothers who smoked 2 to 3 packs of cigarettes per day than among nonsmokers' babies However, a large Boston City Hospital study did not confirm this association when other confounding risk factors were controlled.

Infants born to mothers who smoke are at a higher risk of dying before their first birthdays. This risk is related to the amount smoked. A recent 4-year study of infant mortality found that women who smoked a pack a day or more had a 56-percent higher rate of infant death among their firstborns than nonsmokers. Firstborn babies of mothers who smoked less than a pack a day were still 25 percent more likely to die within the year than nonsmokers' first offspring. Smoking by mothers, regardless of the amount, increased the rate of infant deaths among later children by 30 percent. This increase in infant deaths is primarily due to respiratory difficulties and sudden infant death syndrome (SIDS) – the leading cause of death in babies during their first year.

Effects on breastfeeding: Nicotine is transmitted in breast milk and seems to inhibit milk production, as well as to reduce the level of vitamin C found in breast milk. Women who smoke are less likely to breastfeed their infants than nonsmoking mothers and, if they do begin nursing after delivery, to switch to bottle feeding their babies soon after leaving the hospital.

Effects on the growing child: Children of mothers who smoke while pregnant are more likely to have impaired intellectual and physical

growth. Maternal smoking has also been associated with such behavioral problems in offspring as lack of self-control, irritability, hyperactivity, and disinterest. Long-term studies indicate that these children perform less well than matched youngsters of nonsmokers on tests of cognitive, psychomotor, language, and general academic functioning. However, these differences are small when compared to other factors affecting achievement in these areas.

A recent critical review of these studies now questions whether there is a causal relationship between maternal smoking during pregnancy and deficits in growth, cognitive development, educational achievement, attention span, and hyperactive behavior among offspring. Potentially confounding differences between parents who smoke and nonsmokers in psychological factors and family context of the childrearing environment were not sufficiently controlled in earlier research to attribute differences solely to tobacco's toxic effects.

Maternal smoking does increase a child's chances for developing colds, asthma, and other respiratory problems, although it is not clear whether these effects are from fetal exposure to nicotine or from passive inhalation of household smoke after birth. Evidence from both human and animal studies suggests that in utero exposure to nicotine adversely affects fetal lung development. Still, young babies living in homes where both parents smoke are more often hospitalized for pneumonia or bronchitis than are babies whose parents don't smoke. They are also at increased risk for middle ear infections.

Marijuana

Marijuana consists of the dried parts (flowers, seeds, leaves, and stems) of the Indian hemp plant, *Cannabis sativa*. The drug is usually smoked in cigarettes, pipes, or water pipes for its intoxicating and sensory-distorting "high," although it can be mixed into food and eaten. The major psychoactive ingredient is delta-9-tetrahydrocannabinol (THC), but other components are biologically active, and additional additives or contaminants may be present. Concentrations of THC in legally confiscated marijuana have risen from around 1 to 2 percent in the 1970s to an average of 3 to 5 percent currently. The potency varies widely according to source, ranging as high as 18 percent. This variability in potency and chemical content of marijuana, as well as in use patterns, makes findings from different research studies particularly difficult to compare.

The smoke from marijuana shares many characteristics with tobacco smoke and presents similar dangers. A comparison of the tars from both drugs has shown that, when smoked

the same way, marijuana produces more than twice as much tar as a popular American cigarette and, when inhaled deeply and exhaled slowly—as is usual in smoking this drug—yields nearly 4 times more tar. Inflammation and other abnormalities in the lungs of marijuana smokers have led to warnings that heavy users are at risk for chronic asthma, bronchitis, or emphysema. Marijuana intoxication reduces mental efficiency, especially for complex thinking.

Marijuana is a widely known, thoroughly studied, and very old drug. American medical literature on this drug dates back to 1843 and contains more than 5,000 titles. Yet objective and consistent findings about the health consequences of use, particularly for pregnant women and their offspring, are still sparse. Although pregnant women are less likely to use marijuana than alcohol or cigarettes, heavy marijuana users are less likely to reduce their marijuana consumption during and after pregnancy than to cut back on drinking and smoking.

Suspected mechanisms for drug damage to the fetus: Marijuana readily crosses the placenta, although transfer is apparently higher in early pregnancy than in the last trimester. The drug level in the bloodstream of the marijuana-smoking mother is generally greater than that of the fetus, ranging from 2.5 to 7 times higher. Like cigarettes, marijuana increases carbon monoxide levels in the mother's blood that can reduce oxygen in fetal blood.

Effects on fertility: Chronic marijuana use can lower sperm counts in males and may affect menstrual cycles and ovulation in females. These effects appear reversible when use stops and, in females, when tolerance is established. Temporary sterility may sometimes result, however, when couples are marginally fertile. In laboratory animals, marijuana also inhibits the secretion of reproductive hormones, interfering with ovulation in females and sperm production in males. As with humans, hormone levels return to normal as tolerance develops to chronic exposure.

Despite earlier speculation and warnings of potential genetic damage, no evidence of chromosome damage to cells incubated with THC has been found in either animals or humans.

Effects during pregnancy and delivery: Animal studies suggest that marijuana may cause spontaneous abortions and stillbirths, though only at much higher doses than those used by most drug abusers. Laboratory studies also suggest that animal mothers receiving THC produce more male than female babies. One human study had similar findings: the male-to-female sex-ratio of offspring

increased if either parent was a heavy marijuana smoker.

Because the research findings regarding marijuana effects on human pregnancy are inconsistent, caution is advised in ascribing adverse outcomes to the drug alone. In larger studies, where other maternal factors that might influence outcomes were controlled analytically, the drug did not consistently increase spontaneous abortions, stillbirths, and other interruptions of pregnancy.

Effects on the newborn: Increased tremulousness, altered visual response patterns to a light stimulus, and some withdrawal-like crying have been noted in the newborn infants of women who smoked marijuana heavily while pregnant. Although more subtle long-term consequences cannot be ruled out, these effects usually disappear within 30 days. However, a followup study by the same researchers, using a larger sample, found persisting tremors and startles in the 30-day-old offspring of mothers who regularly used one or more marijuana joints per week while pregnant.

Another 1988 study of neonatal sleep found that maternal marijuana use during pregnancy affected sleep and arousal patterns in the newborn. The long-range implications of this finding are not known.

In studying the relation between fetal marijuana exposure and lowered birthweight or length and shortened gestation, only six studies examined sufficient numbers of subjects to control for such potentially complicating analytic factors as maternal smoking, drinking, other drug use, and race/ethnicity. Unfortunately, the collective findings from these studies are conflicting and difficult to interpret. Unlike the research on tobacco smoking, marijuana use during pregnancy is not consistently associated with lowered birthweight, although individual studies have found some dose-related reductions in gestation, infant length, and birthweight.

Chronic marijuana use can lower sperm counts in men and may affect menstrual cycles and ovulation in women. These effects appear reversible when use stops.

In a thoughtful discussion of the possible reasons for these inconsistent results, one expert highlights (1) likely variations in the composition of marijuana, (2) the problems in teasing out many other maternal factors (health, socioeconomic background, and lifestyle), and (3) other methodological issues. A major concern is underreporting of marijuana use by pregnant women, compared to alcohol and cigarette use.

Most human evidence suggests that fetal marijuana exposure does not, by itself, produce physical abnor-

malities. However, marijuana consumption by pregnant women, when combined with other drug use, drinking, malnourishment, and inadequate prenatal care, may increase the chances of negative fetal consequences. A large Boston City Hospital study found that maternal marijuana use was the strongest predictor of newborns with features compatible with FAS. This finding supports a possible synergistic effect of marijuana when interacting with alcohol and other substances.

Effects on breastfeeding: Marijuana is rapidly transmitted into breast milk and remains there for a prolonged period. Although its effects on nursing infants are unknown, breastfeeding is not recommended for mothers who smoke marijuana and are unwilling or unable to give it up.

Effects on the growing child: Evidence of postnatal problems in children prenatally exposed to marijuana is both limited and inconsistent. In one study, prenatally marijuana-exposed youngsters averaging 4 years of age were slower than matched controls in their visual responsiveness, indicating delayed maturation in this component of the central nervous system.

However, in an ongoing study of babies born to 700 women in Ottawa, Canada, the same researchers have not found prenatal marijuana exposure to be associated with diminished mental, motor, or language outcomes or visual responsiveness in 1- and 2-year-olds. They are not certain whether the apparent normality of these toddlers is due to the transitory nature of effects from prenatal marijuana exposure or whether any adverse effects are too subtle to be measured in early childhood, but may be manifested by school age.

Cocaine

Cocaine hydrochloride, an extract of the coca plant, is a short-acting, powerful stimulant used medically as a local anesthetic. In low doses, cocaine produces a quick "lift" or sense of euphoria with increased energy, mental alertness, and sensory awareness. Larger doses intensify effects, sometimes causing paranoid thinking that may result in bizarre or violent behavior.

Among the most obvious signs of chronic cocaine abuse are weight loss (because the drug suppresses appetite), irritability, and impaired sexual functioning. Cocaine use increases blood pressure and heart rate and constricts blood flow to body organs. Its continued use can damage the heart, increasing the risk for irregular heart rhythms and heart attacks. At high doses, cocaine can cause seizures and death. Combining cocaine with another drug may make it even more dangerous.

Until recently, many believed that cocaine was not physically addicting – would not cause withdrawal symptoms when stopped suddenly. There is now good evidence that cocaine can cause profound dependence. Its abrupt withdrawal is marked by a strong craving for the drug, tremors, muscle pain, changes in brain activity, eating disorders, sleep disturbances, and, sometimes, severe depression and paranoid reactions. Thoughts of suicide may occur.

Most users begin by "snorting" the drug in powder form. Those who inject a soluble form of cocaine or smoke it as freebase get a more intense euphoric reaction, known as the rush. Injection of cocaine produces effects in about 30 seconds that last for 30 minutes. Psychological dependence on cocaine can occur very rapidly. Although the cocaine "high" may be intensely pleasurable, it is quickly followed by a reactive crash, with feelings of depression and despondency. To escape these lows, heavy users tend to repeat the experience, using cocaine in runs, dose after dose, until their supply is exhausted.

Crack is the street name for a form of smokable, rapidly acting freebase cocaine, processed into crystals (rocks) and increasingly available at low cost. Use of crack, especially among urban youth, has grown alarmingly since its introduction in the early 1980s. Smoked crack is 10 to 20 times more potent than powdered cocaine and more likely to result in dependence. Crack and freebase cocaine smokers also tend to use more of the drug than those who inject or snort it.

In a study of 108 cocaine-using mothers, birth outcomes improved for the women who stopped their drug use by the end of the first 3 months of pregnancy.

Cocaine and crack are growing national problems. Drug-related emergency room visits, overdose deaths, and admissions to treatment programs for cocaine use continue to increase at a faster rate than for any other abused drug. Also, the purity of street cocaine escalated from an average of 29 percent in 1982 to 73 percent in 1984.

Another frightening aspect of cocaine use is its frequent combination with other drugs. Heavy cocaine users may turn to heroin, alcohol, or other sedatives to alleviate withdrawal effects. Surveys of addicts in the streets of major cities show a growing preference for speedballing – injecting a mixture of cocaine and heroin.

Women's attraction to cocaine and crack is of particular concern. Injecting cocaine (or other drugs) poses

special dangers of infection with the human immunodeficiency virus (HIV) that causes AIDS. Sharing needles and other injection paraphernalia (works) carrying HIV-infected blood is a primary mechanism for AIDS-virus transmission. Not only is unsterilized equipment more likely to be shared when drugs impair judgment, but women are very likely to share needles with sexual partners who assist them in shooting up. In many inner cities, the escalating use of crack has also resulted in increasing numbers of women exchanging sex for drugs.

Both needle sharing and unprotected sex with HIV-infected partners have increased the frequency of AIDS among women – and among their offspring. Nearly 3 of every 4 cases of AIDS reported in women (73 percent) is directly or indirectly linked to intravenous drug use, and 4 of every 5 youngsters (under 13 years old) with AIDS has a parent who injects drugs. Evidence suggests that from 30 to 50 percent of prenatally exposed babies of HIV-infected mothers are also infected with the virus. It takes as long as 15 months after delivery to confirm whether babies' antibodies reflect their own or their mother's infection. The exact mechanisms and timing of mother-to-child viral transmission are not completely established, but prenatal exposure, delivery, and breastfeeding are implicated.

In addition to increasing risks for AIDS, the sexual promiscuity associated with crack cocaine use has been blamed for growing numbers of women with other sexually transmitted diseases (STDs). Although more treatable than AIDS or HIV infection, these infections can also be transmitted to the fetus or to the infant at birth. The Centers for Disease Control reports that the current epidemic of syphilis among adults and newborns in many inner cities is strongly linked to cocaine and crack use.

Suspected mechanisms for drug damage to the fetus: Cocaine crosses the placenta and reaches the fetus, but its dangers probably reflect actions on the cardiovascular systems of the mother and the fetus rather than more direct toxicity. Cocaine constricts the user's blood vessels, reducing blood flow through the placenta to the fetus and diminishing both the oxygen supply and the nutrients reaching the fetus. The vasoconstrictive properties of the drug also interfere with normal placental functioning and may damage this fetal life-support system. Recent animal research experiments confirm these effects.

Because cocaine is a short-acting drug, with doses repeated at frequent intervals, fetal blood flow reductions due to blood vessel constriction in the mother are likely to be intermit-

tent and potentially disruptive to normal development of fetal tissue. This mechanism would be consistent with recent reports of structural central nervous system abnormalities, intestinal anomalies, and malformations of extremities, as well as urogenital malformations in cocaine-exposed babies. This pathogenic model would also account for differences between malformations observed among cocaine-exposed and FAS-diagnosed babies whose abnormalities reflect impaired body and organ formation during early pregnancy.

Effects during pregnancy and delivery: The earliest reports of cocaine effects on pregnancy noted a high rate of spontaneous abortion and early separation of the placenta from the wall of the uterus (abruptio placentae). The complication of abruptio placentae has now been confirmed in at least five additional studies. In one study of in utero cocaine exposure, abruptio placentae was also associated with an increased number of stillbirths.

Prenatal cocaine use is also associated with an increased rate of premature rupture of membranes, early onset of labor, and preterm delivery. Cocaine apparently causes contractions of the uterus and, according to one neonatologist, "It is common knowledge in the streets that crack will induce labor." Some women have used the drug in attempting self-induced abortions. Premature labor is most likely to occur if cocaine is taken during the last 3 months of pregnancy. Pregnant mothers should be warned that cocaine use within a few days of delivery can be especially hazardous.

At least one study indicates that cocaine use during pregnancy may be more harmful to expectant mothers and their newborns than other drugs. A study of 239 women in Philadelphia found that women who used cocaine during pregnancy had the poorest maternal and infant health outcomes when compared to either non-drug users or to women dependent on other drugs but not cocaine.

In another study of 108 cocaine-using mothers, birth outcomes improved for the women who stopped their drug use by the end of the first 3 months of pregnancy. More of their pregnancies lasted 9 months, and they delivered more normal-weight babies than the mothers who continued using cocaine. Infants born to mothers who stopped using cocaine before the last trimester of pregnancy also had improved intrauterine growth compared to babies exposed to cocaine throughout their in utero development. The rate of early placental separations did not decrease, however, even when cocaine use stopped early in the pregnancy. The damage to the placental and uterine blood vessels that results

from cocaine use in early pregnancy is apparently nonreversible.

Effects on the newborn: Cocaine use during pregnancy is most consistently associated with increased risk among newborns for intrauterine growth retardation (IUGR). This finding has now been confirmed by several different researchers. The largest study examined 1,226 primarily low-income, minority women receiving prenatal care in Boston and found that 114 babies born to mothers with positive urine assays for cocaine had significantly lower birthweight and length and smaller head circumferences than newborns of drug-free controls. The researchers noted that appetite-suppressing characteristics of cocaine are related to poor maternal nutrition, which may also contribute to lowered birthweight in prenatally exposed infants.

The recent dramatic increase in crack cocaine use led a New York research team to compare maternal and infant outcomes for 55 minority women who had smoked crack during pregnancy with 55 non-drug-using pregnant women, matched on other health and lifestyle factors. Over half of the crack users delivered prematurely (50.9 percent versus 16.4 percent of nonusers). Their newborn infants were over 3.5 times more likely to be growth retarded and nearly 3 times more likely to have a reduced head circumference.

Babies born to cocaine-using mothers appear to have fewer clearly discernible withdrawal symptoms than babies exposed to heroin and other narcotics in utero. Although the cocaine-exposed newborns tend to be jittery, to cry shrilly, and to startle at even the slightest stimulation, these effects have generally been attributed to neurobehavioral abnormalities rather than withdrawal. In a comparison of 104 infants born to mothers who had used cocaine, methamphetamine (speed), heroin, and/or methadone during pregnancy, the newborns prenatally exposed to cocaine and/or methamphetamine displayed such altered behavior patterns as abnormal sleep, poor feeding, tremors, and increased muscle tone. The investigators concluded that these behaviors represented direct effects of the drugs, not withdrawal.

Another study of cocaine-exposed infants found signs of central nervous system irritability in 34 of 39 newborns. Although the EEGs (electroencephalograms or brain wave tracings) were abnormal in 17 of these babies during their first week of life, these patterns appeared to be transient and became normal before the babies were a year old.

Neurological abnormalities among cocaine-exposed newborns, such as impaired ability to orient and to control muscles, have also been measured on the Brazelton Neonatal

Behavioral Assessment Scale. This set of tests measures newborns' functioning abilities: how well their eyes react to light, how well they respond to people or to the environment, how quickly they stop reacting to selected visual and auditory stimulation, how well they can use their muscles, and how well body temperature is regulated. Persisting abnormalities of muscle tone, reflexes, and volitional movement were also found in 43 percent of otherwise healthy 4-month-old cocaine-exposed babies, using a set of tests called the Movement Assessment of Infants (MAI). Some muscle tone and movement problems were still apparent when these babies were retested at 8 months. Such movement-related problems in newborns are generally associated with delays or deficits in motor development.

Several studies have suggested an association between in utero cocaine exposure and structural birth defects, notably of the genitourinary tract, cardiovascular system, central nervous system, and extremities.

One investigation of newborns prenatally exposed to cocaine found an increased risk for SIDS, but subsequent and larger prospective studies failed to confirm this.

Several studies have suggested an association between in utero cocaine exposure and structural birth defects, notably of the genitourinary tract, cardiovascular system, central nervous system, and extremities. Cases have also been reported of cerebral infarctions, CNS lesions, and neural tube defects among cocaine-exposed babies. However, although sufficient data for definitive conclusions have yet to be collected in large-scale and well-controlled studies, the risk for major malformations does not appear to be greatly increased among cocaine-exposed babies.

A critical review of 14 recent clinical studies on fetal effects of maternal cocaine use found a total of just 260 infant research subjects who were prenatally exposed only to cocaine and no other illicit drugs. After analyzing the findings to date, this author concludes that prenatal cocaine exposure is most clearly a risk factor for decreased birthweight and small-for-gestational-age babies and is frequently associated with abruptio placenta and premature birth.

Conclusions about increased risk for structural anomalies are still premature, but preliminary data from a large CDC study of birth defects (as well as findings from earlier studies) indicate that defects in the genitalia and urinary tract may, indeed, be more prevalent among cocaine-exposed babies. Continuing reports

of very serious central nervous system malformations, limb anomalies, intestinal impairments, and facial abnormalities are disturbing, but require further confirmation. In utero cocaine exposure is apparently associated with behavioral abnormalities among newborns. All of these cocaine-related risks, however, are ultimately so interwoven and confounded by other maternal risk factors that the absolute risk of maternal cocaine use may never be ascertained.

Effects on breastfeeding: Cocaine use by nursing mothers may also pose a threat to their infants. Two case reports illustrate this. In one, marked tremulousness, irritability, startle responses, and other neurological abnormalities in a 2-week-old infant girl were traced to cocaine in her mother's milk. The infant's urine still contained a byproduct of cocaine 60 hours after last being breastfed by her cocaine-using mother. A more recent report describes convulsions in an 11-day-old nursing infant, resulting from the mother's use of cocaine on her nipples to relieve soreness.

Effects on the growing child: It is too early to know whether the neurobehavioral effects identified in cocaine-exposed newborns continue into later childhood and adult life. Very few studies with large population samples have been completed; more are needed.

Heroin and Other Opioids or Synthetic Narcotics

Opioids are natural and synthetic drugs that primarily act on the central nervous system. Classified as narcotics, this group of drugs includes the illicit substance, heroin, as well as such well-known therapeutic medications as morphine, codeine, meperidine (Demerol), oxycodone (Percodon), hydromorphone (Dilaudid), pentazocine (Talwin), and methadone (used in the treatment of heroin and other opioid dependence). Opium, heroin, and morphine are all derived from the juice of the opium poppy plant.

Like cocaine, heroin in different forms can be inhaled (snorted) or smoked, but is most frequently injected under the skin or into a vein (mainlining). The various synthetics usually come in pill or tablet form, but they can also be dissolved and injected. In general, opioids and related synthetic drugs relieve pain and cause drowsiness, mood fluctuations, brain activity changes, depressed breathing, and slow digestive functioning. Nausea and vomiting are common after initial use; constipation often accompanies regular use.

Chronic users describe psychological reactions in terms of a euphoric "high," followed by mellow "nodding," before withdrawal effects begin. As tolerance develops to the desired psychoactive effects, larger and larger doses are needed to produce the same "high" feelings. Continuous use of opioid drugs, even for relatively short periods of time, causes physical dependence. Once physically addicted, abrupt cessation of opioid use results in withdrawal symptoms (also called abstinence effects).

Pregnancy complications for heroin addicts include increased risk of abruptio placentae, eclampsia, placental insufficiency, breech presentations, premature labor and ruptured membranes, and Caesarean sections. From 10 to 15 percent of these women develop toxemia during pregnancy that may lead to eclampsia.

If untreated, typical flu-like opioid withdrawal symptoms include chills, gooseflesh, tears, runny nose, yawning, rapid heart rate, high blood pressure, perspiration, irritability, cramping, diarrhea, insomnia, and muscle spasms. For most heroin addicts, the peak period of discomfort is 48 to 72 hours after the last drug dose. Without treatment, visible symptoms of withdrawal continue for 7 to 10 days, but it may take weeks for the body to return to normal functioning. Although uncomfortable, heroin withdrawal, unlike that from high-dose, chronic alcohol or barbiturate dependence, is seldom life threatening. Craving for heroin or other narcotics is often described by chronic users long after the body has returned to normal. Relapse is common among heroin users, as it is among chronic abusers of tobacco, alcohol, and cocaine.

The most hazardous overdose reactions to large amounts of narcotics range from breathing difficulties to coma and possible death, caused by suppression of the brain center that regulates respiration. Major medical problems associated with heroin addiction are caused by the additives used to cut heroin before street sales and by infections transmitted in unsterile paraphernalia used for injection. The risk for infection with the virus that causes AIDS is greatly increased among narcotics abusers who inject drugs and share unsterile "works."

In treating heroin addiction, another narcotic, methadone, is sometimes substituted for the illicit drug. Under medical supervision, the methadone dosage may be slowly reduced to prevent the unpleasant effects of cold-turkey withdrawal as the user detoxifies. Alternatively, the

methadone dosage may be maintained at a comfortable level, forestalling withdrawal until the addicted individual has made other lifestyle changes and is better prepared to become and remain drug free.

The extent of heroin use and abuse among women is unknown. Treatment programs generally serve more men than women, although federally funded programs report an increase in the proportion of female clients (to 30 percent) in recent years, especially as more appropriate services are provided.

Studies of narcotic-addicted women find numerous health and psychosocial problems that must be dealt with during treatment and recovery. Women entering drug treatment usually have more medical problems than male addicts, including anemia, STDs, hepatitis, hypertension, urinary tract and other infections, and diabetes. Most come from low socioeconomic backgrounds and are undereducated and unskilled. Many are involved in prostitution at some point and also have criminal histories, with petty charges for shoplifting and other drug-related activities. Most suffer from low self-esteem and depression. The majority are of childbearing age and already have children, although their parenting skills may be limited, and child neglect and abuse are not uncommon. The lifestyles of heroin-abusing women are typically chaotic.

The many complications of heroin addiction cause additional concerns regarding mothering and other risks to offspring. Injection of drugs by the mother or her sexual partner is associated with 4 in every 5 pediatric AIDS cases. The STDs found in female addicts also threaten their babies. Bacterial endocarditis, a life-threatening infection of the heart's lining associated with intravenous drug use, is an added risk for pregnant addicts and their offspring. A recently published case study of seven pregnant women with bacterial endocarditis reported that two of them died shortly after giving birth. Two of the newborns also died as a result of preterm delivery, which may have been related to the disease.

Suspected mechanisms of drug effects on the fetus: It has long been known that opioid drugs taken by the mother reach the fetus. But it only became clear about 18 years ago that newborn babies suffer withdrawal symptoms if their mothers are chronic heroin users. More recent studies have confirmed that opioids cross the placenta and enter the fetal bloodstream, but the level of either heroin or methadone in the fetus remains lower than in the mother. A pregnant woman's use of narcotics may reduce the oxygen supply to the fetus (hypoxia). Alternating toxic and withdrawal effects experienced by the mother also result in an unstable uter-

ine environment. In addition, heroin and other narcotics suppress maternal appetite and may interfere with the absorption of nutrients from foods by reducing intestinal, liver, and pancreatic functioning.

Efforts to explain the long-term effects of prenatal opioid exposure have primarily focused on fetal brain growth. Animal studies have found reductions in the number of brain cells, alterations in brain ribonucleic acid (RNA) and protein content, reductions in the thickness of the cerebral cortex (the outermost layers of brain tissue), retarded development of biochemical systems that carry nerve impulses, and retarded growth of cells affected by withdrawal of opioid drugs. This research is complicated by the fact that the prenatal human brain, like the mature adult brain, contains opioid-like chemicals. One theory suggests that prenatal exposure to opioid drugs retards fetal development by interfering with the growth of brain cells that are sensitive to opioids, both those produced naturally in the body (called endorphins and enkephalins) and those taken as drugs.

Effects on fertility: Opiate use by women increases amenorrhea (cessation of menstrual periods) and menstrual irregularity, thereby interfering with fertility. Many women who use heroin also report a decrease in sexual desire. The STDs associated with prostitution and the lifestyles of many heroin addicts often result in pelvic inflammatory disease (PID). This condition causes scarring of the fallopian tubes and seriously impairs fertility.

Methadone-maintained women are more likely to be fertile after a year or more of treatment when tolerance is well established. However, pregnancy among heroin addicts is not uncommon. Because of menstrual irregularities, heroin-addicted women are likely to misinterpret signs of early pregnancy, such as nausea and tiredness, as withdrawal symptoms. This may delay their confirming and accurately dating their pregnancies.

Effects during pregnancy and delivery: Pregnancy complications for heroin addicts include increased risk of abruptio placentae (early separation of the placenta), eclampsia (a serious, sometimes fatal, toxic condition with high blood pressure, swelling, seizures, or coma), placental insufficiency, breech presentations, premature labor and ruptured membranes, and Caesarean sections. From 10 to 15 percent of these women develop toxemia during pregnancy that may lead to eclampsia.

Heroin use during pregnancy increases the likelihood of stillbirths and fetal distress, indicated by meconium staining (excreting fecal matter

into the amniotic fluid) and aspiration pneumonia in the newborn. These effects are attributed to alternating toxic and withdrawal states in the expectant mother. In addition, nearly half of heroin-dependent women who receive no prenatal care deliver prematurely, often because of infections.

Effects on the newborn: A well-confirmed risk to newborns from mothers' opioid use during pregnancy is intrauterine growth retardation (IUGR) and small size for gestational age. Birthweight in opioid-exposed infants may also be related to the amount of prenatal care their mothers received, as well as to the specific narcotic used. A 1977 study in Philadelphia found that nearly half (47.6 percent) the infants born to 63 heroin-abusing women with no prenatal care were of low birthweight. This contrasted with less than a fifth (18.8 percent) of the babies born to 135 methadone-maintained mothers receiving good prenatal care being of low birthweight. However, appropriate prenatal care did not completely eliminate complications among pregnant opiate-dependent women and their offspring when compared to a similar group of nondrug-using women and infants.

About 80 percent of babies born to heroin-addicted mothers have such serious medical problems as hyaline membrane disease (a serious lung disease), brain hemorrhages, and respiratory distress syndrome. The majority of these complications are the result of prematurity. Infants born to heroin-using mothers are also at risk for perinatally transmitted HIV infection, later developing into AIDS. Higher death rates among these newborns are attributed to SIDS, as well as to poor living conditions in which infections are more likely and more dangerous to premature and/or low birthweight infants.

Although opioid exposure before birth is not usually associated with an increased risk for physical malformations, 1 in 4 infants born to mothers in a methadone treatment program had strabismus – a visual disorder in which the infant's eyes cannot focus together properly. This is a rate 5 to 8 times higher than that in the general population. Since other psychoactive drugs in addition to methadone were used by the mothers during pregnancy, these findings suggest that maternal drug abuse may predispose infants to strabismus and that clinicians should evaluate drug-exposed infants for visual abnormalities.

Dramatic withdrawal symptoms are the most frequently observed consequence to newborns from prenatal narcotics exposure. This neonatal abstinence syndrome has been observed in hundreds of infants born to opiate-addicted mothers. Restlessness, tremulousness, disturbed sleep

and feeding, stuffy nose, vomiting, diarrhea, a high-pitched cry, fever, irregular breathing, or seizures usually start within 48-72 hours. The heroin-exposed infant also sneezes, twitches, hiccups, and weeps. Occasionally, these symptoms do not begin until 2 to 4 weeks after delivery. This irritability, resulting from overarousal of the central nervous system, usually ends after a month, but can persist for 3 months or more.

Between 60 and 90 percent of newborns prenatally exposed to opioid drugs develop abstinence signs requiring special, gentle handling and medication after birth. These difficult newborns, like the jittery cocaine babies, are challenging to their caretakers. Their agitation may discourage appropriate bonding with their mothers unless appropriate parenting skills are taught and encouraged. Heroin-exposed newborns may also have poorly controlled responses to their surroundings and difficulties directing their attention to sights and sounds.

Effects on breastfeeding: Heroin, methadone, and other narcotics (e.g., codeine, morphine) are transmitted in breast milk. Observers in the early years of this century noted that opium withdrawal symptoms in the newborn could be alleviated by breast milk from an addicted mother and that a breast-fed baby could become opioid dependent from nursing. More recently, nursing babies whose mothers regularly used propoxyphene (e.g., Darvon) and oxycodone (e.g., Percodon) showed signs of drowsiness and failure to thrive.

Breastfeeding by motivated mothers in well-supervised methadone treatment programs should not automatically be ruled out, particularly during the first 6 to 8 weeks postpartum when the greatest immunologic and bonding benefits are likely to result. Some research studies suggest that the newborn would be exposed to very small amounts of prescribed methadone in breast milk, especially when compared to prenatal exposure levels from the same dosage. Before a methadone-maintained mother is encouraged to nurse, she should be (1) well controlled on a stable dosage, (2) in good health, with adequate nutrition, (3) not infected with HIV, tuberculosis, or hepatitis B, and (4) not using alcohol and other drugs.

It is important to note that cases of HIV transmission through breast milk have been documented. Furthermore, the amount of methadone transmitted and consumed by the growing baby, if nursing continues beyond 3 to 6 months of age, may make later breastfeeding inadvisable. Close monitoring is needed of the nursing baby's responses and the lactating mother's potential for other illicit drug use.

Effects on the growing child: When heroin-exposed babies are followed beyond the withdrawal period, their abilities to adapt to their surroundings and to interact with their caregivers seem to improve. After a month, only subtle differences can be observed between most of these babies and infants not exposed to narcotics in utero. However, the development of muscle control may be uneven and motor coordination more impaired in children who experience severe neonatal withdrawal.

Followup studies of babies born to heroin-using or methadone-maintained women have been particularly difficult: (1) the mothers drop out of the studies and cannot be traced, (2) the babies grow up in very different home environments that make it difficult to differentiate outcomes resulting from drug exposure from those stemming from caretaking variations (especially continuing drug abuse by parents, as well as the presence or absence of the mother), and (3) the mothers have very different lifestyles during pregnancy that also effect outcomes in their infants.

Nonetheless, growth disturbances and other behavioral effects such as hyperactivity, shortened attention spans, temper tantrums, slowed psychomotor development, and impaired visual motor functioning have been noted in infants and older children born to opiate-dependant mothers. Several studies have shown problems in speech development. However, test scores measuring these children's physical and psychological development are generally within the normal range.

Many of the problems associated with prenatal exposure to heroin also occur after prenatal exposure to methadone. The findings regarding prenatal effects of methadone, it should be noted, are complicated by the fact that methadone-dosed mothers are likely to continue using other drugs, including heroin. In general, babies born to methadone-maintained women receiving adequate and consistent prenatal care thrive better and have fewer neurological complications than those whose mothers continue to use heroin or to take methadone in an uncontrolled manner during pregnancy.

The heroin-exposed babies, at 1 year of age, tended to be impulsive, easily upset by frustration, and had sleep disturbances and temper tantrums. Between 12 and 18 months, they were clearly hyperactive.

A long-term study compared babies of heroin-using, methadone-maintained, and drug-free mothers receiving prenatal care at a Houston

city-county hospital. The heroin-exposed babies, at 1 year of age, tended to be impulsive, easily upset by frustration, and had sleep disturbances and temper tantrums. Between 12 and 18 months, they were clearly hyperactive. The clinician in this study observed that the early years of heroin-exposed children are filled with "turmoil and chaos." After studying the school performance of prenatally heroin-exposed youngsters between the ages of 6 and 11 years, this researcher noted that their most distinguishing characteristic, in contrast to groups with drug-free or methadone-maintained mothers, was an early separation from biologic mothers. Only 8 percent of untreated mothers, versus 50 percent of the methadone-treated mothers, still had contact with their children after 3 years. Otherwise, there were more similarities than differences in offspring of untreated addicts and those of matched women not from this background.

Experts generally agree that children of addicts have numerous school and behavioral problems, whether they are born to drug-using mothers or raised by drug-using caretakers. This finding has important implications for interventions to (1) improve the home surroundings and daycare opportunities of drug-exposed youngsters and (2) enhance the parenting skills of their caretakers.

Phencyclidine

Phencyclidine or PCP is a synthetic drug, known by a variety of names (peace pill, angel dust, hog) in different parts of the country. Initially developed as an anesthetic for humans and later used for animals, it is no longer used for either purpose. PCP first became popular for its psychoactive effects in the early 1970s

A study of nine infants whose mothers primarily used PCP during pregnancy found these newborns to be more emotionally unstable and less consolable than infants prenatally exposed to other drugs.

but was rapidly abandoned by users because of its unpredictable effects, including hostility, aggressiveness, and other bizarre behavior. During the late 1980s, PCP resurfaced among inner-city youth, particularly Black males, in several major cities.

The effects of this unique and complex drug vary greatly according to the dose, manner in which it is taken, and the expectations of the user. In some users, it evokes feelings of power, strength, and invulnerability, followed by depression. PCP may cause agitation and confusion, feel-

ings of grandiosity, impaired coordination, and incoherent speech. Sometimes the effects mimic symptoms of schizophrenia and result in admission for psychiatric treatment. Chronic use can be quite dangerous in adults and is associated with increased risk for memory and speech problems, hallucinations, paranoia, psychotic episodes, seizures, and death by suicide or other violent means. Users often combine their PCP consumption with cocaine, marijuana, and/or alcohol.

The drug is rather easily made in illegal laboratories, sells at relatively low cost, and comes in liquid, powder, or pill form. It is usually taken orally or mixed with marijuana, parsley, mint, or tobacco and smoked in cigarettes, but it can also be injected. PCP contains many contaminants. Once consumed, PCP remains in the brain and in body fats for a long time.

Suspected mechanisms for drug damage to the fetus: Like most other drugs, PCP crosses the placenta in both animals and humans. In mice, it enters the fetal brain quickly – as early as 15 minutes after the mother is injected – but is not detectable there after 24 hours. In one study, the concentration in fetal body tissue was 10 times higher than in the mother's blood. No byproducts of PCP were found, which suggests that the fetal liver does not break it down.

Effects during pregnancy and delivery: Very little research has been conducted on the effects of PCP on prenatally exposed newborns and infants. The first descriptive reports were published in 1980. There have been some animal studies and comparisons between PCP-exposed babies and infants exposed to different drugs. One difficulty encountered by investigators of PCP effects on pregnancy and offspring is the pattern of multiple substance use by virtually all of the mothers. Various combinations of alcohol, cocaine, and marijuana, along with PCP, are reported.

Effects on breastfeeding: PCP is transmitted to the nursing infant in breast milk. In animal research, significant activity changes are noted in nursing offspring of PCP-using mothers.

Effects on the newborn: The first case reports of newborn behavior attributed to the mother's heavy and regular consumption of PCP during pregnancy described extreme jitteriness, poor visual coordination, coarse flapping movements in response to very slight touch or sound stimuli, and abnormal muscular tension. Only 1 of the first 3 babies studied had physical abnormalities.

A larger study of nine infants whose mothers primarily used PCP during pregnancy found these new-

borns to be more emotionally unstable and less consolable than infants prenatally exposed to other drugs. Although the PCP-exposed babies had rapid state changes (alternating between restlessness and calm), they did not exhibit withdrawal symptoms.

Animal studies suggest that PCP may cause birth defects. Extremely high doses of PCP cause malformations and abnormal behavior in laboratory animals, but these dose levels are far higher than human consumption of the drug. In human studies, which now include approximately 200 cases of PCP-exposed offspring, congenital birth defects have not been found. Since most of the mothers in the largest study abused several drugs, this finding needs further verification.

Effects on the growing child: Although a leader in both medical practice and research on drugs and pregnancy has observed that prenatal PCP damage may not show up until months after birth, findings to date have not revealed long-term neurobehavioral deficits. However, only a few studies with small numbers of cases have been completed, and more research is needed.

In followup studies of nine infants whose mothers primarily abused PCP throughout pregnancy, mild neurobehavioral deficits and small-for-age head circumferences were observed in the PCP-exposed babies during the first year of development, although body length and weight were in the normal range. However, by 2 years of age, no differences were found in mental or psychomotor development between the PCP-exposed toddlers and normal controls. Since developmental scores declined for all the groups in the study, including different sets of drug-exposed infants and normals, the investigator suggests that an infant's early caretaking environment may contribute more to its normal development than prenatal drug use by the mother.

Prescription Medications And Other Licit Substances

The focus of this booklet is on the dangers to pregnant or nursing mothers and their drug-exposed infants of common psychoactive substances that are used for nonmedical purposes. However, health care professionals counseling women of childbearing age must help them realize that many prescribed medications, over-the-counter remedies, vitamins, industrial chemicals, and other environmental pollutants can also pose hazards to their unborn children. Pregnant or lactating mothers should routinely be reminded to report and discuss with their doctors any medications and vitamins they take, even if these substances have been previously prescribed for them.

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Table 1.—FDA pregnancy categories

Category	Interpretation
A	**Controlled studies show no risk.** Adequate, well-controlled studies in pregnant women have failed to demonstrate risk to the fetus.
B	**No evidence of risk in humans.** Either animal findings show risk, but human findings do not or, if no adequate human studies have been done, animal findings are negative.
C	**Risk cannot be ruled out.** Human studies are lacking, and animal studies are either positive for fetal risk, or lacking as well. However, potential benefits may justify the potential risk.
D	**Positive evidence of risk.** Investigational or postmarketing data show risk for the fetus. Nevertheless, potential benefits may outweigh the potential risk.
X	**Contraindicated in pregnancy.** Studies in animals or humans or investigational or postmarketing reports have shown fetal risk that clearly outweighs any possible benefit to the patient.

Some medically useful drugs are also taken for nonmedical reasons or used in ways the doctor or the package instructions do not recommend. Tranquilizers, sleeping pills, cold remedies, and other commonly used drugs may be taken more frequently than recommended, in larger than prescribed doses, or over a longer time than indicated. Sometimes women share these medicines or experiment with different mixtures.

As an example of the prescribing difficulties posed for physicians (and for scientists and government officials charged with making public health recommendations), there is new, but as yet inconclusive, evidence from several independent studies that neural tube defects (NTDs) in newborns may be prevented by making certain that women are not vitamin deficient, particularly in the folic acid-containing B vitamins, before they become pregnant or in the critical first 6 weeks after conception. Natural folic acid is primarily found in cooked green vegetables, brewer's yeast, chicken livers, and lentils.

Approximately 1 in every 1,000 newborn babies in the United States has a neural tube defect, the second most common birth defect after Down's syndrome. This very serious abnormality causes a fatal condition, anencephaly, in which the brain never develops, or spina bifida, in which a portion of the baby's spinal cord is exposed or covered only by skin. If the baby does not die, mental retardation and paralysis of the lower portion of the body may result. Very expensive surgical and medical treatments are usually required.

The women most at risk for delivering babies with NTDs are those with folic acid-poor diets who are also likely to have unplanned pregnancies. Although it might seem sensible to recommend multivitamin supplements for all women who are considering pregnancy or who are at risk for unplanned births, several government agencies and physician organizations hesitate to do so because excessive doses of vitamin A can cause birth defects.

CDC, the National Institutes of Health, and the FDA worry that once young women hear that vitamins can prevent fetal damage, they may take larger than recommended doses, inadvertently harming the babies they carry. In fact, even at doses that are not toxic to adults, vitamin A may cause severe malformations in fetuses. Some young women already take large doses of vitamin A for acne, or may even switch to megadoses of it when they become aware of the prescription drug Accutane's hazards during pregnancy. Public education about the dangers of thinking "more is better" may be helpful. In the meantime, at-risk women who wish to conceive or are already pregnant need to be cautioned about both the potential hazards of vitamin deficiency in relation to NTDs and the dangers of overdosing on vitamin A.

FDA product-labeling information pertaining to pregnancy: The FDA requires manufacturers to describe and categorize what is known about each marketable drug's potential risk to the fetus, balanced against its potential benefit to the patient. This information must be included in a special section of the product-labeling data. *The Physician's Desk Reference* and several similar annually revised publications contain this product-labeling information for most available drugs. The pregnancy categories are shown in table 1.

Prescription drugs with well-established adverse effects on prenatally exposed infants include the following:

- *Accutane* (isotretinoin) – an antiacne medication and vitamin A derivative that is associated with such major abnormalities in prenatally exposed babies as micro-

cephalus (small head with severe retardation) and defects of the external ear and cardiovascular system.

- *Antibiotics*, including tetracyclines and some sulfanilamides. Tetracyclines used during the latter half of pregnancy may cause permanent discoloration of a child's teeth.
- *Antimigraine medicines* with ergotamine are not recommended for pregnant women and may cause reactions in nursing infants such as vomiting, diarrhea, weak pulse, and unstable blood pressure.
- *Salicylates* including Bufferin, Anacin, Empirin, and other aspirin-containing medications, when taken by pregnant women at therapeutic doses close to term or prior to delivery, may cause bleeding in the mother, fetus, or the newborn infant. Regular use of aspirin in high doses during the last 6 months of pregnancy has been shown to prolong pregnancy and delivery. Aspirin is excreted in human breast milk in small amounts and may cause metabolic acidosis or a rash or affect the blood.
- *Anticonvulsants* such as Dilantin (phenytoin) and other antiseizure medications have been associated with an increase in heart malformations, cleft lip and palate, microcephaly, mental deficiency, and impaired growth among prenatally exposed babies. Nevertheless, preventive treatment of the mother should not be discontinued during pregnancy, since there is a strong possibility that withdrawal may cause seizures, with resulting oxygen reduction and threat to the fetus. Phenytoin is excreted in low concentrations in human breast milk, and women taking this drug should not nurse.
- *Hormones* contained in birth control pills should not be taken during pregnancy (especially the first 4 months) as fetal exposure, even for brief periods, may increase the risk of congenital abnormalities, including heart and limb reduction defects. Exposure to some estrogens during fetal development has been shown to increase the risk for vaginal or cervical cancer among adolescent offspring. There have also been rare reports of breast enlargement in nursing infants exposed to contraceptive pills and a decrease in the mother's milk production.

Because many women are prescribed or illegally obtain and abuse tranquilizers and sedative-hypnotics, their potentially adverse consequences for pregnant or nursing

mothers and their babies deserve special mention. In some parts of the country, benzodiazipines are very popular street drugs, used to boost the effects of other illicit drugs and/or to relieve withdrawal symptoms.

Tranquilizers: All the benzodiazepines (minor tranquilizers) have been associated with increased reproductive risks. Use of tranquilizers by pregnant women may complicate delivery and leave newborns lethargic, with respiratory difficulties, apneic spells (episodes of not breathing), poor muscle tone, and decreased sucking ability. These tranquilizers should be used with caution during labor because they can depress infants' respirations.

Diazepam (Valium) consumed during the first 3 months of pregnancy has been linked to a fourfold increase in cleft palates, lip anomalies, and other malformations of the heart, arteries, and joints. The risk of these congenital defects seems to increase when diazepam is combined with smoking and alcohol use.

A 1989 Swedish case study of eight offspring of mothers whose excessive use of benzodiazepines during pregnancy was confirmed by blood tests, reported birth defects resembling those seen in the fetal alcohol syndrome. All but one infant were also significantly below average in birthweight.

Chlordiazepoxide (Librium) use by mothers during the first 6 weeks of their pregnancies has been linked to CNS abnormalities in infants.

Diazepam, when used daily for the last 2 to 4 months of pregnancy in dosages as low as 10 to 15 mg, has been found to result in tremulousness and other symptoms of withdrawal in the newborn. Flurazepam (Dalmane), given in 30-mg doses for 10 days, has been associated with lethargy and abnormal muscle tone in newborn infants lasting several days after birth.

Because diazepam accumulates in breast-fed infants, it and meprobamate (Equanil, Miltown), should not be used by nursing mothers.

Barbiturates: Long-acting barbiturates (phenobarbital) taken as antiseizure medications have also been associated with congenital birth defects resembling FAS. Even short-acting barbiturates (Seconal, Tuinal) have been associated with increases in birth defects and are not considered safe for use during pregnancy.

Chronic use of barbiturates during the last months of pregnancy, at doses of 60 to 100 mg per day, has been associated with infant withdrawal symptoms appearing 4 to 7 days after birth. These typically include high-pitched crying, irritability, tremulousness, and sleep disturbances that can persist for months and can interfere with mother-infant bonding.

Counseling Women About Childbearing and Childrearing Risks

Counseling women about the childbearing and childrearing risks associated with alcohol and other drug use is a challenging task. Despite recent research advances and greater public attention to these hazards, too many women, as well as their physicians, are still uninformed or misinformed about the dangers to themselves and their unborn children of using drugs in the period before conception, during pregnancy, or while nursing. Many still don't recognize the very real threat of perinatal HIV infection, AIDS, or syphilis transmission.

Because reproductive choice and safety are sensitive issues, health care professionals need to become better informed, not only about the facts, but also about how to communicate accurate information in timely, effective, and nonjudgmental ways.

For more than a decade, innovative perinatal programs in several major cities have made pioneering efforts to meet the special needs of chemically dependent women and their infants. Based on their experience, dedicated staff in these programs offer helpful advice for reaching and working with alcohol- and drug-using pregnant women and their babies. Their suggestions are summarized as follows.

1. **Keep messages clear, simple, and realistic.**

Education begins with information and understanding. Despite the complexity of the topic, most women do not want to be overwhelmed with data and extraneous material. Keep to the facts, as briefly as possible. Do not use technical language that will not be understood. Based on marketing research, neither sensationalism nor humor are effective approaches in dealing with this serious subject.

Because alcohol and other drug use before conception and during pregnancy are risk factors over which most women have direct control, the

Table 2.—Sample counseling approaches

Positive Approach	Negative Approach
If you stop drinking now, you have a better chance of having a healthy baby.	Your drinking has already damaged your baby.
Your concern for your baby will help you be a good mother.	If you really loved your baby, you would not drink so much.
You will feel better when you are sober and so will your child.	Continued drinking will ruin your health and prevent your child from developing normally.

dangers need to be understood. However, if the message is exaggerated or too frightening, there is the possibility that women may either ignore the warning as unrealistic or take it too seriously, increasing their anxiety and stress. There are many risks in pregnancy, as in life, and women should not be misled into thinking they, alone, can guarantee a healthy baby. A balanced perspective is needed.

Do, however, stay abreast of popular myths and particularly dangerous practices by pregnant women in your specific community and provide up-to-date and factual information to dispel misconceptions and prevent hazardous behaviors. Many women, for example, do not realize how potentially serious and long-lasting the effects of low birthweight can be for the developing child. They need convincing, realistic education about the implications. In some inner-city areas, pregnant women are apparently using crack cocaine when labor begins to reduce the discomforts of delivery, not understanding the very serious dangers this poses to the infant.

2. Stress the positive.

Pregnant women are more receptive to information that emphasizes the positive, not just negative and discouraging "don'ts." Clinicians at the Boston FAS prevention program provide the examples shown in table 2.

3. Don't predict the outcome of a particular pregnancy.

Remember that statistics are not cases. Even though experts may agree that certain undesirable effects are likely to result from maternal alcohol or other drug use during pregnancy, risk statistics cannot predict a given outcome for a particular

person. The odds only specify the overall probability.

Warnings about risks may even backfire if a drug-abusing woman gives birth to an apparently healthy baby. The new mother may then conclude that the experts were wrong and refuse to heed further advice. It is important, therefore, to word information about possible negative consequences as cautiously as possible. Emphasize the ever-present hope that the mother may be lucky and escape the odds this time. She can, of course, improve the chances considerably by stopping drug use immediately and following other health recommendations.

4. Deliver personal, individually tailored messages.

There is no substitute for individual attention. Even brief comments, delivered in person, are more effective than written information or audiovisual presentations without followup interpretation or discussion. The concern and interest displayed by the health educator seem to be as important as the information itself in communicating effectively.

Sensitivity to the communication styles of different groups can also enhance their receptiveness and understanding. Special attention needs to be directed to mothers who are isolated from the primary culture by virtue of poverty, ethnicity, or low literacy. Women from minority groups often need special encouragement to talk about sensitive and personal topics. Asian and Hispanic women, for example, are socialized not to ask questions, even when they do not understand the information being provided. Brochures and posters may need translation into native languages or into the local slang and jargon; messages may need changing to reflect relevant and culturally acceptable themes. Any written information should be pretested with the narrowly defined target group to make certain it is believable, as well as understandable.

5. Help women assess their risk.

One of the most important contributions health care professionals can make toward reducing the harmful consequences of maternal drug abuse is to help women understand and acknowledge their own risk behavior. This requires a combination of sensitive observation, direct questioning, and informed testing, with followup suggestions and support.

Of course, preconception counseling and care are the preferred ways to prevent or reduce the many interrelated medical and psychosocial risks – in addition to alcohol and other drug use – that endanger women's pregnancies and offspring. Indeed, the 1989 Report of the Public Health Service Expert Panel on the Content of Prenatal Care *(Caring for Our Future: The Content of Prenatal*

Care) recommends that preconception care be integrated into a variety of primary care settings to include (1) risk assessment and diagnosis, (2) health promotion and education, and (3) treatment and referral.

These services would be much more widely available if they were routinely incorporated into school health examinations, premarital applications, family planning and genetic counseling, general health care in family practice or other specialist settings, treatment of alcohol and other drug abuse problems or sexually transmitted diseases, and pediatric or well-child examinations. As the expert panel cogently stated:

> Because healthy women are more likely to have healthy babies, assuring good health prior to conception simply makes good sense and should be standard care. Diagnosis and interventions to treat medical illness and psychosocial risks prior to conception will eliminate or reduce hazards to the mother and baby. Care is also likely to be more effective prior to conception because evaluation and treatment can be initiated without harm to the fetus.

When taking medical histories and conducting physical examinations, health care practitioners can watch out for illnesses and physical symptoms associated with drug dependency (e.g., hepatitis, vaginal infections, anemia, nasal inflammation from cocaine use, track marks from drug injection, or stained fingers from cigarette smoking). Gynecologists and obstetricians can be alert for such problems in patients' previous pregnancies as placental abnormalities, low birthweight babies, or an FAS-diagnosed child.

More importantly, physicians and associated health care professionals need to *ask* childbearing-age women direct questions about their alcohol and other drug use. A whole literature exists on the most effective ways to imbed screening questions in routine medical history taking – appropriate phrasing and the sequence of questions to ask – about associated problems and use patterns for substances ranging from tobacco and alcohol through the illicit drugs.

When possible, and with informed consent, the blood or urine of pregnant women should be analyzed for drug metabolites. Objective laboratory testing seems to encourage more accurate responses to drug-history questions and is appropriate as a screening mechanism, if used with supportive followup counseling.

6. Motivate risk reduction and provide ongoing hope.

Indeed, the whole purpose of questioning women about their drug-using behavior is to help them find appropriate ways to quit or reduce potentially harmful use patterns. For the vast majority of women considering

pregnancy – or those already pregnant or breastfeeding – supportive education will be sufficient. The Seattle Pregnancy and Health Program, aimed at reducing smoking and drinking among pregnant women, found that women who were only occasional drinkers responded positively to media campaigns, even when this was the only information source. Moderate drinkers were more likely to stop drinking if messages were conveyed personally. However, sizable percentages of both groups quit or reduced potentially dangerous drug use in response to widespread public education emphasizing positive behavior.

Motivation to stop dangerous behaviors can be increased considerably if the woman is engaged in setting her own realistic goals for positive change, if she is supported by relevant suggestions and attainable interim steps, and if achievement is consistently praised while behavior is monitored over time. A one-shot effort is not sufficient.

Even if drugs have been used during the pregnancy, emphasize the benefits of quitting as soon as possible, following medical advice and supervised withdrawal if drug or alcohol use is heavy and chronic. Research indicates that the developing fetus may have a chance to catch up in growth and to recuperate from some types of drug-related damage if the mother's use is reduced or halted after pregnancy begins. For example, women who quit smoking cigarettes by the fourth month of pregnancy have no higher risk of delivering low birthweight babies than nonsmokers. Similarly, when heavy drinking ceases early enough during pregnancy and maternal nutrition improves, outcomes for the babies also improve substantially.

Other studies have shown that babies whose mothers took heroin or PCP while pregnant were eventually able to catch up with normal children. Babies' brains, with proper stimulation and caretaking, are surprisingly pliable and may be able to overcome some subtle forms of neurological damage. It should be noted, however, that long-term followup studies are still needed in this area, and the findings to date are not all consistent.

7. **Recommend drug abuse treatment when patient-physician goals for abstention are not easily achieved.**

Because "safe" limits for alcohol and other drug use during pregnancy cannot be established, most health care professionals advise total abstinence from all nonessential medications, beginning before conception and continuing through breastfeeding. This is a simple message that most women will try to follow, although it may not be appropriate advice for all.

This is particularly true for chemically dependent women, who need sensitive intervention and referral for further counseling and treatment to help them attain and maintain abstinence. As one prominent chemical dependency specialist states, "A woman who continues to use drugs after she becomes aware of the danger to her unborn child probably is more addicted than abusive and can't quit." Repeated warnings, without offering a realistic treatment alternative, are likely to frustrate both the health care worker and the patient.

Making a good referral can be very difficult. Many drug treatment programs will not accept pregnant women; there are waiting lists for any form of publicly funded substance abuse treatment in many major cities, particularly residential facilities; and matching a woman with the most appropriate and available type of care further complicates the process. Even though chronic drug abusers seldom limit themselves to one substance, the interventions for smoking, alcoholism, and various other drug addictions are often handled separately. Services are also provided in a variety of settings, including hospitals, halfway houses, therapeutic communities, daycare centers, and ambulatory clinics.

Ideally, a chemically dependent pregnant woman should be provided with comprehensive, one-stop services, including prenatal supervision, obstetrical care, psychosocial counseling, and followup postnatal support at a specialty perinatal center. Her multiple health, social, legal, psychological, recreational, childcare, and vocational-economic needs should be addressed simultaneously through case management and appropriate referral, using a team of professionals.

Because the many problems of drug-abusing women, pregnant addicts, and their children are priority concerns, the Federal Government is requesting more resources for outreach, treatment, and research activities in this area. The Offices for Substance Abuse Prevention and Maternal and Child Health are jointly funding model demonstration programs on prevention, education, and early intervention with substance-abusing pregnant and postpartum women and their infants. NIDA is also awarding grants for research and development of outreach approaches, as well as efficacious treatment and intervention services for this population. States are also being encouraged to make prevention and treatment services for alcohol-and other drug-abusing women a priority concern. At least one State (California) now requires that priority be given to pregnant women seeking treatment for alcohol or other drug abuse.

Until appropriate drug abuse and alcoholism treatment services for

pregnant women and their offspring are well publicized and available in every community, health care workers will need to become familiar with local resources and the existing treatment network. The most common therapeutic approaches, which may be applied separately or in combination, are the following:

- Pharmacotherapy – using other drugs as a medically supervised alternative for maintenance or detoxification (e.g., methadone), for blocking or inhibiting particular effects, or for symptomatic relief of undesirable side effects of withdrawal

- Behavioral management – using professional verbal therapy or peer counseling and the numerous self-help approaches, individually or in groups, contingency contracts, learning and skill development, or positive and aversive conditioning

- Environmental controls – separating the abuser and the drugs in residential services or through changes in peer groups and intimates

Most of the pharmacotherapeutic treatment approaches are contraindicated for pregnant women because of the drugs' known or suspected teratogenic effects (e.g., Antabuse therapy for alcoholics). However, special mention should be made of methadone treatment for opioid dependence. This is often the preferred treatment for pregnant women whose heroin-addicted lifestyles pose substantial risks for their unborn babies. These include not only continuing use of a variety of drugs, but also HIV infection, serious medical illnesses, poor nutrition, and lack of prenatal care.

Although prenatal exposure to methadone is likely to produce some undesirable consequences for the fetus and the newborn, many specialists who have evaluated these hazards for more than 20 years believe that participation in a well-supervised treatment program where a carefully controlled and individually tailored maintenance methadone dose can be administered throughout pregnancy is a less risky alternative than continuing heroin abuse. Methadone treatment is also an effective AIDS prevention strategy. Federal regulations governing aspects of methadone treatment programs now require special consideration for pregnant patients.

8. Be sensitive to the legal implications.

The subject of drug use during pregnancy, while attracting more scientific interest and research, is simultaneously evoking heated public and political controversy. One center of current debate is the potential criminalization of prenatal drug use.

In some States, a mother's failure to stop using specified illegal drugs during pregnancy may be considered child abuse or neglect. In cases where the newborn tests positive for these substances at delivery, hospitals may be required to report this information. The child could then be taken into protective custody and placed in the care of a social service agency. In more extreme cases, the mother may even be charged with breaking the law.

Legal requirements for reporting alcohol and other drug use by pregnant women vary by State and are evolving rapidly. There is no clear consensus yet about how to balance and protect the rights of an unborn infant with the rights of the infant's mother. However, the dominant emerging view from a variety of professional specialists in health care, child welfare, and the law is to approach adverse consequences of prenatal and postnatal drug use as social-medical problems, not readily amenable to punitive legal sanctions.

Meanwhile, health care workers need to keep abreast of legal developments and to be sensitive to their implications when drug abuse by a pregnant woman is suspected and a treatment referral is suggested. Some women will avoid drug treatment or prenatal care if the responsibilities of health care workers are not understood or if their motivations are viewed with suspicion.

9. **Provide special help with parenting.**

Mothers who deliver babies with physical defects, withdrawal symptoms, or other problems of prematurity or low birthweight need special help. Their anxiety and guilt are likely to interrupt important infant-mother attachment processes. A baby's prolonged stay in the hospital, as well as the infant's irritability and adjustment difficulties, can frustrate the mother and increase her stress and anxiety. She will desperately need understanding guidance and very specific training in how to care for this needy infant.

Special parenting skills are also needed for babies whose neurological impairment is not discovered for months or years after birth. Mothers and fathers need to recognize the developmental milestones of normal growth and what a difference their loving attention can make in overcoming a child's learning deficiencies, behavioral problems, or attentional deficits. Some educators believe that developmental outcomes after birth are more related to environmental conditions and responsive caretaking than to prenatal difficulties. Specific help can be provided in infant stimulation or play therapy, as well as parent training, for these mothers and fathers, some of whom may have lacked adequate nurturing themselves.

Summary

Although prenatal drug exposure is associated with a variety of effects on the fetus and the developing child, there are a number of similarities in the consequences resulting from maternal use of the different drugs discussed in this booklet. Here are some generalizations that can be made about the childbearing risks involved and other findings from research in this area:

- When a mother uses drugs, her unborn or nursing infant is also affected. During gestation, almost all drugs cross the placenta and enter the bloodstream of a developing baby. A breastfeeding mother's milk also contains the drugs she takes.

- Drug use during the early weeks of pregnancy, from the fourth to the eighth weeks following conception, is more likely to cause spontaneous abortions or noticeable physical abnormalities in the newborn than use later in the pregnancy. Many women do not even realize they are pregnant during this very important period when the major skeletal and organ systems are forming and are most vulnerable to toxic effects from drug exposure.

- After the eighth week of pregnancy, maternal drug use is more frequently associated with growth retardation, prematurity, and neurological damage to the infant. Drug use near the time of delivery may precipitate labor and can be hazardous. Both prematurity and low birthweight are related to very serious problems in young infants, including increased rates of respiratory illness, sudden infant death syndrome, infections, and developmental delays.

- Sometimes a mother's physical health requires medications that pose some risk for her unborn baby. Then, physician-patient agreement is needed on the most sensible course of treatment, balancing the mother's need against potential harm to her fetus. Medically supervised maintenance on methadone for heroin-using mothers is an example of this type of decision-

making, as is the choice of an appropriate anticonvulsant for a pregnant woman with epilepsy.

- Women who smoke cigarettes, drink alcoholic beverages, or use illicit drugs during pregnancy increase their risks for obstetrical complications and for premature labor and delivery. They are also more likely than abstaining mothers to suffer fetal losses through spontaneous abortions, miscarriages, and stillbirths.

- Prenatally drug-exposed infants are also at risk for a variety of adverse consequences, including death before their first birthdays. In utero drug exposure is additionally associated with an increased rate among newborns of (1) low birthweight, with small-for-gestational-age length and head size, (2) central nervous system damage that may delay or impair neurobehavioral development, (3) mild to severe withdrawal effects, and (4) certain congenital physical malformations (e.g., cleft palate, heart murmurs, eye defects, and abnormalities of facial features and other organ systems).

- Risks are related to the amount of the drug taken by the mother and the stage of pregnancy when embryonic or fetal exposure occurs. The heavier and more persistent the mother's drug use, the more likely there will be adverse consequences. The sooner a woman stops using drugs during pregnancy, the greater her chances for having a healthy baby. Even cutting down on tobacco, alcohol, and other drug use while pregnant can reduce the risks to the unborn.

- The surest way to avoid harming the baby is to stop taking all unnecessary drugs, preferably before pregnancy begins. Chronic drug abuse can also interfere with a woman's fertility, causing menstrual cessation or irregularities, ovulation problems, and changes in sexual functioning.

- Not all babies show negative effects from prenatal exposure to drugs. A variety of genetic factors in the unborn baby and maternal characteristics, as well as differences in the chemical structure of drugs and their use patterns, interact to influence the vulnerability of the unborn baby. No one can say for certain which baby will be all right and which will have abnormalities. Drug-related effects may be worse if the mother has a poor diet, little exercise, medical illnesses, inadequate prenatal care, or other complications of pregnancy.

- The majority of pregnant women can and do stop using alcohol and other drugs – or cut back considerably – once they realize the dangers. Chemically dependent women, however, are not so likely to change their addictive drug use patterns without help. For them, giving up drugs, whether cigarettes, alcohol, or other psychoactive drugs, is more easily said than done. These expectant mothers often need professional treatment and certainly need a comprehensive and reliable support system to help them abstain and remain drug free.

- Because of legal and social interests in protecting babies, a pregnant woman who continues to take drugs against medical advice risks losing custody of her baby after it is born. In some States, she also risks criminal prosecution.

- Although maternal consumption of specific drugs can produce particular effects in the developing fetus and growing child, the negative consequences of alcohol, cigarette, and illicit drug use in pregnancy often seem more alike than different. This is partly because many women use more than one drug while pregnant, making it difficult to separate confounding and interactive effects of multiple drug use in the research findings. Women who drink are also very likely to smoke. Many others use, but do not reliably report, illicit drugs, prescription medications, and over-the-counter remedies while pregnant.

- Newborns with drug-related impairments are often difficult to handle. To avoid maternal-infant bonding problems and feelings of failure or rejection in the mother, expert guidance and dependable support services are needed after the babies are born, sometimes for months.

- In many cases, drug-associated deficits only become apparent as a child matures. Mental retardation, lowered intelligence, hyperactivity, shortened attention spans, learning and organizational disorders, impaired physical coordination, continuing growth delays in height, weight, and head size, and social-interpersonal adjustment problems are found with greater regularity among prenatally drug-exposed youngsters than in similar children whose mothers did not use drugs during pregnancy.

- In the long run, a baby's caretakers and learning environment are as important as the mother's

prenatal drug use for healthy growth and development. A stimulating and supportive family life is vital for overcoming or ameliorating damage to the child from drug exposure in the uterus. Many mothers – and fathers – from impoverished backgrounds need help with parenting skills, as well as with other psychosocial and economic problems. Ultimately, the best hope for any child is a healthy and nurturing family.

For More Information

Selected Health Information Clearinghouses

Clearinghouse on Child Abuse and Neglect Information
P.O. Box 1182
Washington, DC 20013
703/821-2086

National Center for Clinical Infant Programs
(publishes the Bulletin *Zero to Three*)
2000 14th Street North, Suite 380
Arlington, VA 20001
703/528-4300

National Center for Education in Maternal and Child Health
38th and R Streets, NW
Washington, DC 20005
202/625-8400

National Clearinghouse for Alcohol and Drug Information (NCADI)
P.O. Box 2345
Rockville, MD 20852
301/468-2600; 1-800/729-6686

National Maternal and Child Health Clearinghouse
38th and R Streets, NW
Washington, DC 20057
202/625-8410

Office on Smoking and Health
Technical Information Center
5600 Fishers Lane, Park Bldg., Room 116
Rockville, MD 20857
301/443-1690

327-404 0 - 92 - 3

Compendiums of Resources

Healthy Mothers, Healthy Babies: A Compendium of Program Ideas for Serving Low-Income Women, January 1986.

Available from the National Maternal
and Child Health Clearinghouse
202/625-8410

Describes strategies used by 1,500 programs nationwide – a new supplement is being prepared. Focuses on reproductive issues from prepregnancy through postnatal services and on special populations.

Reaching Out: A Directory of National Organizations Related to Maternal and Child Health, March 1989.

Available from The National Maternal
and Child Health Clearinghouse
202/625-8410

Lists organizations by age group and health topic area. Also lists self-help clearinghouses by State.

Starting Early: A Guide to Federal Resources in Maternal and Child Health, November 1988.

Available from The National Maternal
and Child Health Clearinghouse
202/625-8410

Lists publications and audiovisual materials by health topic.

Drug Abuse Information and Referrals in the Special Supplemental Food Program for Women, Infants, and Children: A Resource Manual for Program Development, March 1990

Available from the WIC Supplemental Food Program,
Food and Nutrition Service, U.S. Dept. of Agriculture
202/756-3730

Annotated bibliography of written and audiovisual materials to educate staff and low literacy clients about the hazards of drug use during pregnancy and breastfeeding.

Publications and Pamphlets

American Cancer Society (or local chapters)
1599 Clifton Road, NE
Atlanta, GA 30329
404/320-3333

Materials to help stop smoking.

American Council for Drug Education
204 Monroe Street, Suite 110
Rockville, MD 20852
301/294-0600

Materials on drugs and pregnancy and specific drugs.

American College of Obstetricians and Gynecologists (ACOG)
409 12th Street, SW
Washington, DC 20024
202/638-5577

Materials on birth control, nutrition, and prenatal care.

American Lung Association (or local chapters)
1740 Broadway
New York, NY 10019
212/315-8700

Materials to help stop smoking.

American Red Cross (or local chapters)
Chapter Headquarters
2025 E Street, NW
Washington, DC 20002
202/737-8300

Courses and training of trainers for prenatal care and nutrition.

Healthy Mothers, Healthy Babies Coalition (or State chapters)
409 12th Street, SW, Room 309
Washington, DC 20024
202/638-5577 or 863-2458

Information and education to improve maternal/infant health.

La Leche League International, Inc.
9616 Minneapolis Ave, P.O. Box 1209
Franklin Park, IL 60131
708/455-7730

Materials on breastfeeding.

March Of Dimes Birth Defects Foundation (or local chapters)
1275 Mamaroneck Avenue
White Plains, NY 10605
914/428-7100

Materials on prenatal care, drugs and pregnancy. Copies of some pamphlets and other materials in Spanish.

National Association for Children of Alcoholics
31582 Coast Highway, Suite B
South Laguna, CA 92677
714/499-3889

Materials and support groups for children of alcoholics.

National Association for Perinatal Addiction Research and Education (NAPARE)
11 East Hubbard Street, Suite 200
Chicago, IL 60611
312/329-2512

Materials, curricula, and conferences on drugs and pregnancy.

National Cancer Institute
Office of Cancer Communications
Building 31, Room 10A24
Bethesda, MD 20892
1-800-4-CANCER

Materials to help stop smoking.

National Council on Alcoholism and Drug Dependence, Inc.
12 West 21st Street, Eighth Floor
New York, NY 10010
1-800-NCA-Call; 212/206-6770

Materials on alcoholism, FAS, and FAE.

National Head Start Association
1220 King Street, Suite 200
Alexandria, VA 22314
703/739-0875

Materials and support for preschool education and parenting.

National Sudden Infant Death Syndrome Clearinghouse
8201 Greensboro Drive, Suite 600
McLean, VA 22102
703/821-8955

Materials to explain this serious risk associated with drug use during pregnancy.

Planned Parenthood Federation of America, Inc.
810 Seventh Avenue
New York, NY 10019
212/541-7800

Materials on family planning.

Teratology Society (or State chapter)
9650 Rockville Pike
Bethesda, MD 20814
301/571-1841

Information on specific teratogenic agents.

Help With Treatment Referrals

A variety of self-help groups are available in local communities. These include Alcoholics Anonymous, Al-Anon, Adult Children of Alcoholics, Cocaine Anonymous, Narcotics Anonymous, Parents Anonymous, and Women for Sobriety. Listings of meetings can be obtained from headquarters offices with telephone numbers in local directories.

Local affiliates of the National Council on Alcoholism and Other Drug Abuse sometimes provide referral services, not only to public facilities but also to private programs, therapists, and physicians.

Contact alcohol and other drug abuse treatment programs in local hospitals and health centers, listed in the telephone directory under alcohol, alcoholism, drug treatment, and similar headings. Some directories list human services agencies in the front section of the white pages.

The National Association of State Alcohol and Drug Abuse Directors (NASADAD) keeps a current list of agencies and directors in each State that oversee alcohol and other drug abuse prevention and treatment activities. The NASADAD telephone number is 202/783-6868.

The National Clearinghouse for Alcohol and Drug Information (listed above) can provide some information on where to call in various States and regions of the country. The Clearinghouse telephone number is 301/468-2600.

The National Institute on Drug Abuse Treatment Referral Hotline directs drug users and their families to drug treatment facilities in local communities. The telephone number is 1-800-662-4357.

Recommended For Further Reading

ALCOHOL AND PREGNANCY

- For Staff

Alcohol and Birth Defects: The Fetal Alcohol Syndrome and Related Disorders, 1987.

DHHS Pub. No. ADM 87-1531
Peter L. Petrakis
Available through NCADI: 301/468-2600.

A 56-page publication summarizing current clinical and animal research related to fetal alcohol effects and FAS. Bibliography included.

Preventing Alcohol-Related Birth Defects, Fall 1985.

Alcohol Health and Research World, Special Issue. 10:(1)
Available through NCADI: 301/468-2600; 1-800-729-6686.

Preventing Fetal Alcohol Effects, 1981.

R. J. Sokol, S.I. Miller, and S.S. Martier
Superintendent of Documents, U.S. Government Printing Office
Washington, DC 20402

A 20-page guide for health care professionals to use in screening and identifying patients who use alcohol during pregnancy. Single copies free. May be duplicated.

Special Population Module on FAS/FAE, 1988.
A.P. Streissguth, Ph.D.
University of Washington Medical School
Department of Psychiatry and Behavioral Sciences
Seattle, WA 98195

A 15-page manual for health educators trying to prevent FAS/FAE. Bibliography and annotated list of model programs and materials on FAS. Single copies free.

- For Clients

My Baby ... Strong and Healthy, 1986/Reprinted 1988.
DHHS Pub. No. (ADM)86-1436
Available through NCADI: 301/468-2600; 1-800-729-6686.

A 16-page, illustrated booklet depicts alcohol as a drug, discusses effects of drinking on the fetus, provides alternatives to drinking during pregnancy, and describes the dangerous interactive risks when drinking is mixed with smoking and other drug use. (Spanish version – Hi Bebe...Fuerto y Sano).

Alcohol and Pregnancy
Health and Nutrition Service of Racine, Inc.
2316 Rapids Drive
Racine, WI 53404
414/637-7750

A fact sheet suitable for low-literacy clients that discusses how alcohol can damage unborn babies, FAS, and some suggestions for abstaining. Single copies are free and can be duplicated.

Alcohol and Your Unborn Baby, 1984.
American College of Obstetricians and Gynecologists
409 12th Street, SW
Washington, DC 20024
202/638-5577

Eight pages of discussion about alcohol use during pregnancy, with guidelines for the prevention of FAS. Single copies are free.

Will Drinking Hurt My Baby? 1986.
March of Dimes Birth Defects Foundation (or local chapters)
1275 Mamaroneck Avenue
White Plains, NY 10605
914/428-7100

An easy-to-read 2-page pamphlet that summarizes the dangers of drinking during pregnancy and defines FAS. Single copies free and duplication permitted.

TOBACCO AND PREGNANCY

- For Staff

Smoking and Reproductive Health, 1987.
M.J. Rosenberg, editor
Littleton, MA: PSG Publishing Co.

Smoking and Pregnancy: Kit for Health Care Providers
The American Lung Association
1740 Broadway, New York, NY 10019
212/315-8700

Contains a handbook for counseling the pregnant woman who smokes, a flip chart, two posters for display, and two leaflets to give to patients. Also available from local affiliates.

Helping Smokers Quit
The National Cancer Institute, Office of Communications
Building 31, Rm 10A-24
Bethesda, MD 20892
1-800-4-CANCER

Contains a guide for physicians, a test for patients, tips for quitting, facts about what happens after quitting, and posters.

Special Delivery: Smoke Free Facilitator's Guide, 1988.
The American Cancer Society (or local chapters)
1599 Clifton Road, NE
Atlanta, GA 30329
404/320-3333

A program to help women stop smoking during pregnancy, with accompanying videotape. Single copies free.

Why Start Life Under A Cloud? 1986.
The American Cancer Society (or local chapters)
1599 Clifton Road, NE
Atlanta, GA 30329
404/320-3333

A short pamphlet discussing the effects of smoking on unborn babies. The reading level is too sophisticated for low literacy clients, but could be explained by staff.

- For Clients

Babies Don't Thrive in Smoke-Filled Rooms, 1986.
March of Dimes Birth Defects Foundation (or local chapters)
1275 Mamaroneck Avenue
White Plains, NY 10605
914/428-7100

A brief 4-page pamphlet that highlights risks of smoking during pregnancy.

Facts About Smoking and Pregnancy, 1984.
Tineke Boddé
National Institute of Child Health and Human Development, 9000 Rockville Pike, Building 31, Room 2A32
Bethesda, MD 20895
301/496-5133.

An illustrated brochure summarizing the research findings on the impact of maternal smoking on the developing fetus.

Freedom from Smoking for You and Your Baby, 1986.
American Lung Association
1740 Broadway, New York, NY 10019
212/315-8700

A 10-day self-help guide for mothers to stop smoking. Includes a progress record. Copies are $1.40 each.

I Quit Smoking Because ..... I Love My Baby, 1982.
American Lung Association (see above)

An 8-page booklet describing the reasons why mothers should not smoke while pregnant, emphasizing the benefits of quitting at any time.

Pregnant? That's Two Good Reasons to Quit Smoking, 1983.
National Institute of Health
NHLBI Smoking Educational Program Information Center
4733 Bethesda Avenue, Suite 530
Bethesda, MD 20814
301/951-3260

Brief 8-page booklet describes risks and encourages mothers to quit smoking. There is an accompanying poster. Single copies free.

DRUGS AND PREGNANCY

- For Staff

The Fact Is .... Alcohol and Other Drugs Can Harm an Unborn Baby
Available from NCADI
P.O. Box 2345
Rockville, MD 20852
301/468-2600; 1-800-729-6686

This 13-page fact sheet summarizes the risks associated with prenatal use of alcohol and other drugs and lists books, journals, brochures, audiovisuals, and other resources on this topic.

Drugs, Alcohol, and Pregnancy, 1988.
Christina Dye
Do It Now Publications
P.O. Box 21126
Phoenix, AZ 85036
602/491-0393

A 24-page booklet covering everyday social toxicants, prescription medications, illicit substances, and "non-drug" drugs in the context of a healthy pregnancy. Includes a section on breastfeeding. Price not available.

Drugs and Pregnancy: It's Not Worth the Risk, 1986.
American Council for Drug Education
204 Monroe Street, Suite 110
Rockville, MD 20850
301/294-0600

Developed to help physicians identify and refer patients who use drugs during pregnancy, this 36-page booklet summarizes recent research on maternal drug use and other factors affecting risk levels during pregnancy. Copyrighted. Copies are $3.00 each.

- For Clients

Drugs, Alcohol, Tobacco Abuse During Pregnancy, 1987.
March of Dimes Birth Defects Foundation (or local chapters)
1275 Mamaroneck Avenue
White Plains, NY 10605
914/428-7100

A two-page pamphlet with basic facts about the effects on the fetus and newborn from exposure to tobacco, alcohol, prescription drugs, antacids, aspirin, laxatives,

vitamins, caffeine, and uppers, downers, and street drugs. Single copies are free, and duplication is permitted.

I Want To Have a Healthy, Happy Baby, 1988.

Trish Magyari
Georgetown University Child Development Center
3800 Reservoir Road, NW
Washington, DC 20008
202/687-8635

A 6-page pamphlet describing the dangers of alcohol, cigarettes, and other drug use during pregnancy. Also discusses risks for AIDS. Developed for a primarily Black, inner-city audience in the District of Columbia. Single copies free and duplication permitted.

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Alcohol, Drug Abuse and Mental Health Administration. The high risk of cocaine, other drugs. *ADAMHA News. 15(9):3,12, 1989.*

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